Operation and Instruction Manual

Series I
Marine Generator Sets

Model Numbers

MP5.5M
MP8M

19 May 2004
Revision 1

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Safety Precautions

Important information on safe and efficient operation. Read this information before installation, operation, or maintenance of your equipment.

To protect yourself and others from hazards and to prevent accidents, be aware of potential danger and act with caution. Read, follow, and save these safety instructions.

The levels of hazards that may result from equipment mishandling are classified and explained in the following table.

Classification	HAZARD LEVEL
⚠ DANGER	A hazard is present that **will cause severe personal injury**, **death**, or **substantial property damage**.
⚠ WARNING	A hazard is present that **can cause severe personal injury**, **death**, or **substantial property damage**.
⚠ CAUTION	A hazard is present that **will** or **can cause minor personal injury** or **property damage**.

Accidental Start of Generator Set

⚠WARNING

Generator can be started by remote control.
Accidental start of the generator can cause severe injury or death.

Some generator sets may be equipped with the automatic start feature. Before attempting any repair, perform the following steps to disable the generator set and prevent an automatic start:

1. Place the generator set start/stop switch in the STOP position.
2. Disconnect the power to the battery charger, if equipped.
3. Remove the battery cables, negative (–) lead first. Reconnect the negative (–) lead last when reconnecting the battery.

Fuel and Exhaust System Vapors

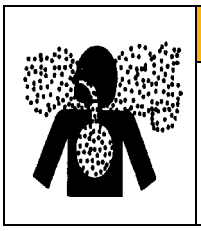
⚠WARNING

Explosive fuel and gasoline vapors can cause severe injury or death.
Use extreme care when handling, storing, and using fuels.

Vaporized fuels are highly explosive. Use extreme care when handling and storing fuels. Before starting the generator set, operate the blower 4 minutes and check the engine compartment for fuel vapors.

- Store fuels in a well-ventilated area away from spark-producing equipment and out of the reach of children.
- Never add fuel to the tank while the engine is running because spilled fuel may ignite on contact with hot parts or from sparks.

- Do not smoke or permit flames or sparks to occur near sources of spilled fuel or fuel vapors.
- Keep the fuel lines and connections tight and in good condition.
- Use pipe sealant on threaded fittings to prevent fuel leakage.
- Do not operate the generator set in the presence of fuel leaks, fuel accumulation, or sparks. Repair fuel systems before resuming generator set operation.
- Use a container to catch fuel when draining the fuel system, and wipe up spilled fuel.



⚠WARNING

Carbon monoxide. Can cause severe nausea, fainting, or death.
The exhaust system must be leakproof. Routinely inspect the system for leaks.

Carbon monoxide is an odorless, colorless, tasteless, nonirritating gas that can cause death if inhaled for even a short time. Use the following precautions when installing and operating the generator set:

- Do not install the exhaust outlet where exhaust can be drawn in through portholes, vents, or air conditioners. If the generator set exhaust discharge outlet is near the waterline, water could enter the exhaust discharge outlet and close or restrict the flow of exhaust.
- Never operate the generator set without a functioning carbon monoxide detector. Be especially careful when anchored and operating the generator set under calm conditions because gases may accumulate.
- When operating the generator set dockside, ensure that your exhaust is directed away from other boats and buildings.
- Inspect the exhaust system and carbon monoxide detector on a regular basis.

Hazardous Voltage/Electric Shock

⚠WARNING

Hazardous voltage. Can cause severe injury or death.
Operate the generator set only when all guards and electrical enclosures are in place.

- Ground electrical equipment.
- Before servicing the equipment, open the main circuit breakers of all power sources.
- Disconnect the generator set from the load by opening the line circuit breaker or by disconnecting the generator set output leads from the transfer switch and heavily taping the ends of the leads.
- Observe the following precautions when performing voltage tests:
  1. Remove all jewelry.
  2. Stand on a dry, approved electrically insulated mat.
  3. Do not touch the electrical enclosure or components inside the enclosure.

Battery Acid and Gases

⚠WARNING

Sulfuric acid in batteries. Can cause severe injury or death.
Wear protective goggles and clothing. Battery acid may cause blindness and burn skin.

- Battery electrolyte is a diluted sulfuric acid. Always wear splash proof safety goggles, rubber gloves, and boots when servicing the battery. Also, be sure to remove all jewelry.
- Do not open a sealed battery or mutilate the battery case.
- Battery gases can cause an explosion. Do not smoke or permit flames or sparks to occur near a battery at any time, particularly when it is charging.

- Do not dispose of a battery in a fire.
- Turn the battery charger off before connecting the battery.
- To avoid sparks, do not disturb the battery charger connections while the battery is charging.
- Ventilate the compartments containing batteries to prevent accumulation of explosive gases.
- Disconnect the battery before generator set installation or maintenance.
- Remove the negative (–) lead first when disconnecting the battery; reconnect the negative (–) lead last when reconnecting the battery. (Never connect the negative (–) battery cable to the positive (+) connection terminal of the starter solenoid.)
- Do not test the condition of the battery by shorting the terminals together.

Moving Parts

⚠WARNING

Rotating parts. Can cause severe injury or death.
Do not operate the generator set unless all guards, screens, and covers are in place.

- Keep hands, feet, hair, clothing, and test leads away from the belts and pulleys when the generator set is running. Do not operate the generator set with the belt guard removed.
- The generator set must be operating in order to perform some scheduled maintenance procedures. Be especially careful if the sound shield has been removed, leaving the belts and pulleys exposed (*sound-shield-equipped models only*).
- Before working on the generator set or equipment connected to the set, disable the generator set as follows:

  1. Place the generator set start/stop switch in the STOP position.
  2. Disconnect the power to the battery charger, if equipped.
  3. Remove the battery cables, negative (–) lead first. Reconnect the negative (–) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

Fire Hazards/Hot Parts

⚠WARNING

Fire. Can cause severe injury or death.
In case of fire, do not open the sound shield or compartment.

To avoid serious injury or death from fire, shut down engines, generator sets, and blowers. Immediately discharge entire contents of gaseous portable fire extinguisher through the access port or other provision.

- Do not smoke or permit flames or sparks near the fuel line, fuel filter, fuel pump, or other potential sources of spilled fuels or fuel vapors.
- Do not operate the generator set with the air cleaner/silencer removed.
- Keep the compartment and the generator set clean and free of debris to minimize the risk of fire. Wipe spilled fuels and engine oil.

⚠WARNING

Hot coolant and steam. Can cause severe injury or death.
Before removing the pressure cap, stop the generator set and allow it to cool. Then loosen the pressure cap to relieve pressure.

⚠WARNING

Hot engine and exhaust system. Can cause severe injury or death.
Do not work on the generator set until it cools.

- Before checking the engine, allow it to cool.
- Remove the cap after pressure has been completely released and the engine has cooled. To release pressure, cover the pressure cap with a

thick cloth and then slowly turn the cap counterclockwise to the first stop.

- Do not touch hot engine parts. The engine and exhaust system components become extremely hot during operation.

Hazardous Noise

⚠CAUTION

Hazardous noise. Can cause hearing loss.
Never operate the generator set without a muffler or with a faulty exhaust system.

- Generator sets not equipped with sound enclosures can produce noise levels greater than 105 dBA. Prolonged exposure to noise levels greater than 85 dBA can cause permanent hearing loss. Wear hearing protection when near an operating generator set.

Hazardous Waste Materials

⚠CAUTION

Disposal of waste materials.
Failure to properly dispose of waste materials will cause environmental pollution.

When disposing of hazardous waste materials, follow the instructions below.

1. Be sure to contain waste liquids, such as lube oil and coolant, in a suitable receptacle. Take the necessary precautions to prevent the waste liquids from spilling on the ground.
2. Do not dump waste liquids into sewer, river, soil, or sea water.
3. Dispose of hazardous wastes such as lube oil, coolants, solvents, various filters, and batteries, according to environmental laws and regulations.

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Chapter 1 Introduction

This Operation Manual describes how to operate, maintain, and service MasPower Series I Models MP5.5M and MP8M marine generator sets. Please read the manual thoroughly before using the generator set, to ensure proper handling and operation. After you have read the manual, keep it safely stored and accessible. **Pay particular attention to the section on Safety Precautions** (see pages iii–vi).

To maintain your generator set in the best running condition, follow all instructions carefully. For your convenience, we have included a Maintenance Schedule chart that lists the items that should be inspected or checked on a regular basis; and whether the necessary maintenance or repair is simple enough to be performed by the owner, or must be handled by an authorized service center.

Also included is a Service Log where you can keep track of the cumulative operating hours of your generator set and enter the dates of service.

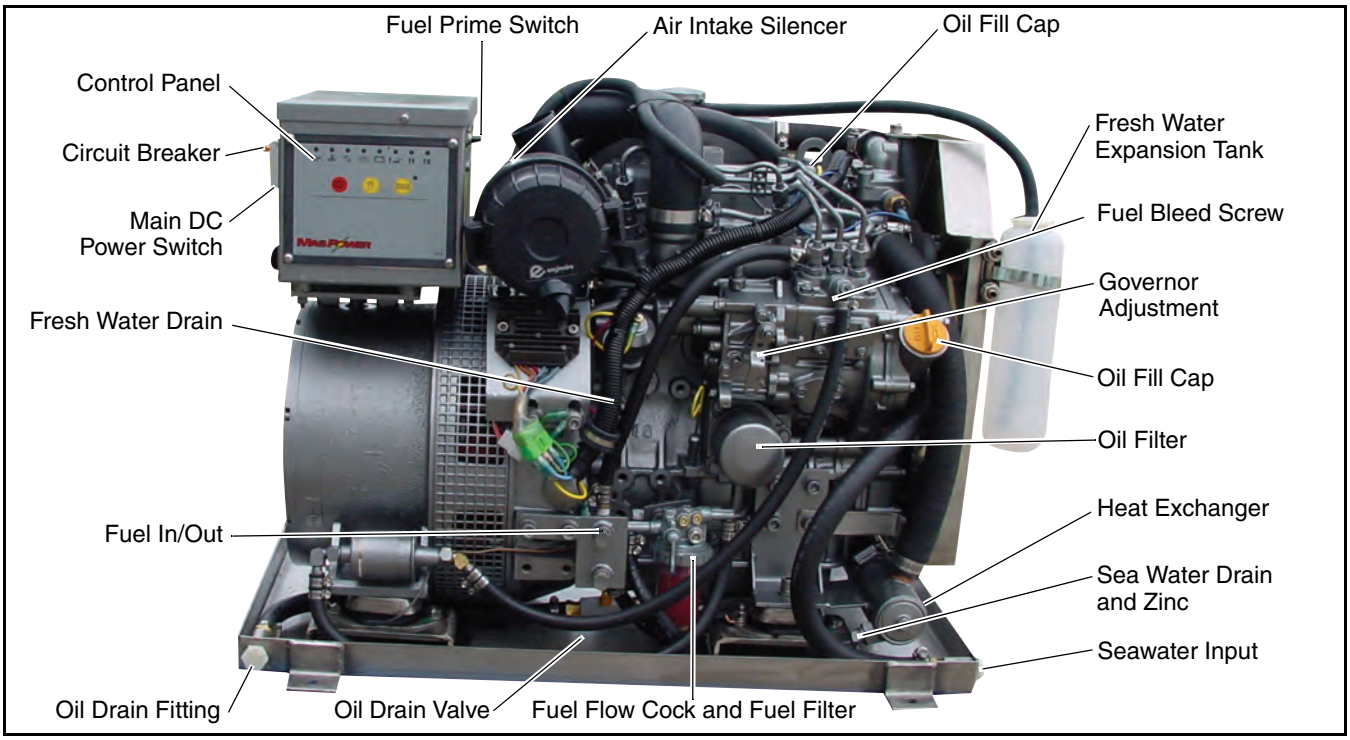
If you require information regarding government regulations or industry standards that relate to installation or use of marine generator sets, refer to the Related Publications section in the Appendix. You will also find a glossary of terms and abbreviations in the Appendix.

All information included in this Operation Manual is current as of the date of publication. Because we are constantly working to improve the performance and quality of our products, the product described in this manual may differ slightly from your product. We reserve the right to change the content and/or product shown as we deem necessary, without incurring any obligation.

The MasPower Series 1 Generator Set is designed to give safe and dependable service, provided it is operated and maintained according to instructions. Therefore, if you have any questions or concerns, do not hesitate to contact your nearest authorized dealer.

Chapter 2 Specifications

2.1 Service Views



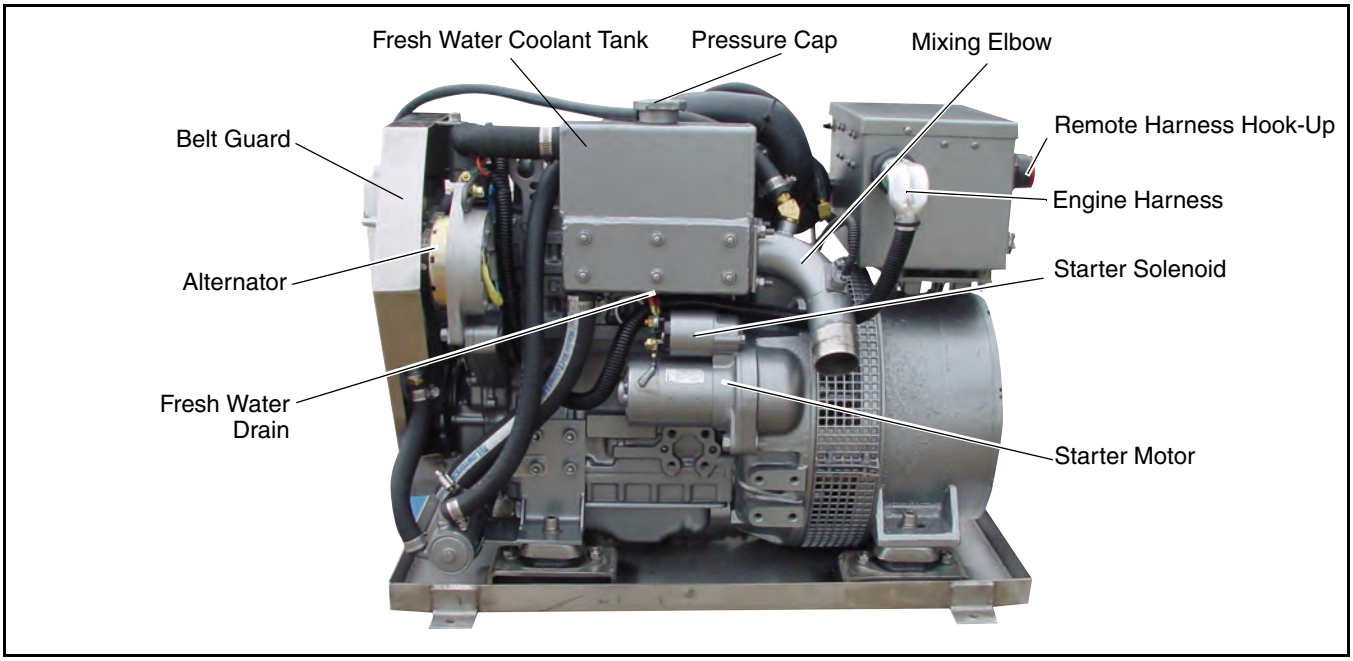


Figure 2.1 Typical Service Views

NOTE: Consult an authorized distributor/dealer or the service manual for items not shown.

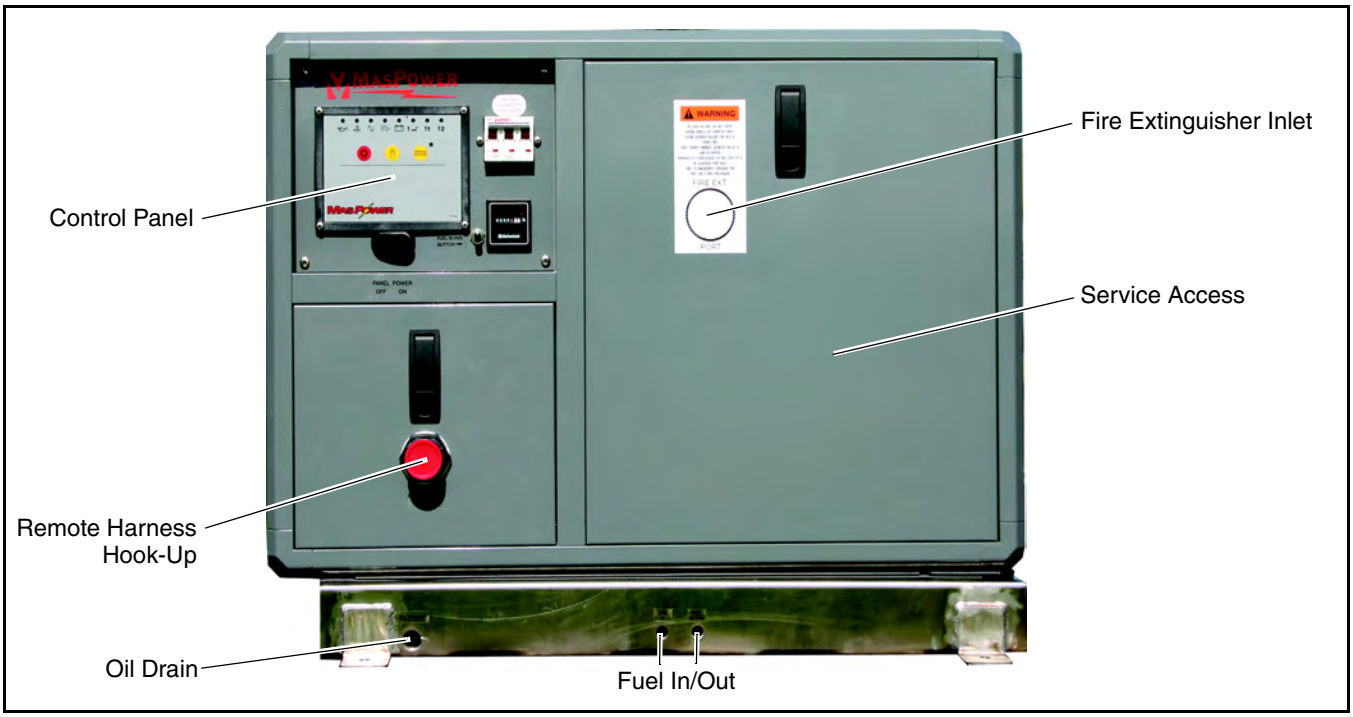


Figure 2.2 Generator Set shown with Optional Sound Enclosure

2.2 General Specifications

		Generator Set Model	
Description	**Units**	**MP5.5M**	**MP8M**
Dimensions:			
Length	in. (mm)	28 (711.2)	29 (736.60)
Width	in. (mm)	18 (457.2)	18 (457.2)
Height	in. (mm)	21.75 (552.45)	22 (558.8)
Dimensions w/sound enclosure:			
Length	in. (mm)	40 (1016)	32 (836.6)
Width	in. (mm)	21.75 (552.45)	21.75 (442.45)
Height	in. (mm)	24.5 (622.3)	24.5 (622.3)
Weight (wet)	lbs (kg)	410 (186)	458 (208)
Weight w/sound shield (wet)	lbs (kg)	485 (220)	560 (255)
Angular Operation (max.) (in all directions)[1]	degrees	25°	25°
Minimum clearances for vibration and cooling (top, front, rear, and sides) (without optional sound shield)	in. (mm)	1.5 (38.1)	1.5 (38.1)
Air Requirements—CFM (L/min.)	cfm (L/min.)	22.7 (641)	29.12 (825)
Fuel Consumption U.S.[2]			
Load 100%	gal/hr (L/hr)	0.56 (2.16)	0.87 (3.2)
75%	gal/hr (L/hr)	0.46 (1.7)	0.65 (2.4)
12 Volt Starting Battery Size (0°F [–18°C])	CCA	500	500
Maximum Allowable Exhaust Back Pressure	mm H_2O (kPa)	1000 (9.81)	1200 (11.77)
Minimum Exhaust Hose Size I.D.	in. (mm)	2.0 (51)	2.0 (51)
Maximum Ambient Air Temperature	degrees F (C)	140 (60)	140 (60)
Maximum Allowable Engine Room Depression	in. H_2O (kPa)	0.2	0.2
Total Fuel Flow (Supply and Return) for Filter Sizing	GPH (L/hr)	3.6 (16.3)	4.6 (20.91)

Notes:
1. Intermittent angular operation can be as much as 30 degrees (for 3 minutes or less).
2. Fuel consumption may very slightly.

2.3 Generator

2.3.1 General Description

The generator used in the Series 1 generator set is a self-exciting, synchronous, brushless type machine.

Generator features include the following:

- Rotor is compactly constructed with an integral damper cage and field winding section conductor directly wound on the rotor.
- Special interpole fixation combined with the mechanical compactness of the winding ensures high operational reliability.
- The generator is manufactured and tested according to NEMA standards, ISO standards, and IEC recommendation.
- The exciter is a 4-pole, synchronous generator with salient poles on the stator and cylindrical armature on the rotor.
- The system is excited automatically by means of residual magnetism of the magnetic circuits of the generator and exciter, stabilized by the permanent magnet in one of the exciter poles.
- Mounted on a stainless-steel, drip pan.
- Standard SAE housing with a coupling disc.

2.3.2 Generator Ratings

Model Series	Voltage	Hz	77°F (25°C) Amps	77°F (25°C) kW/kVA	Phase ϕ
MP5.5M	120/240	60/50	45.8/22.9	5.5/5.5	1
MP8M	120/240	60/50	66.7/33.3	8/8	1

NOTE: All units are rated 1.0 power factor. Ratings are based on an altitude of 500 ft (150 m) above sea level.

2.4 Alternator

Alternator specifications are listed in the following chart:

Description	Models MP5.5, MP8M
Generator Type	Four-Pole, Rotating Field
Coupling Type	Flexible Disc
Excitation Type	Brushless Exciter
Shaft RPM (50/60 Hz)	1500/1800
Number of Output Leads	4
Voltage Regulator Model	VR 2.4
Voltage Regulation	±3%
Frequency Regulation	±4%

Voltage connection and derate factors determine actual generator set output kW/kVA.

2.5 Controller

2.5.1 Controller Features

For a description of how the controls and indicators for the Series I generator set operate, refer to Chapter 3. The following is a list of controller features:

- Start/Stop switch
- Starter interlock (prevents reengagement of starter whenever engine is running)
- Hourmeter for scheduling maintenance
- Safety shutdowns:
  - — Over speed
  - — Under speed
  - — High exhaust temperature
  - — High head temperature
  - — High coolant temperature
  - — Low oil pressure
- Plugs/receptacle controller connections
- Terminal connections:
  - — Clearly identified
  - — Corrosion resistant
- Quick disconnect wiring harness
- Adjustable voltage regulator

2.6 Engine

2.6.1 Engine Features

The engine used in Series I generator sets is manufactured by Yanmar. Features of the engine are as follows:

- 12V fuel pump
- Battery charging alternator
- Belt guard
- Disposable oil and fuel filters
- Electric fuel pump with 1/4 NPT fuel inlet
- Full flow cooling system (thermostat bypass)
- Glow plugs for cold start
- High water temperature and high exhaust temperature cutout
- Low oil pressure cutout
- Oil drain valve and hose
- One-side serviceability of fuel system, lubrication system, seawater pump, and air cleaner
- Vibration isolators

2.6.2 Engine Specifications

Description	Units	Generator Set Model	
		MP5.5M	MP8M
Engine Manufacturer		Yanmar	Yanmar
Engine Model		3TNE68	3TNE74
Number of Cylinders		3	3
Number of Cycles		4	4
Cylinder Block Material		Cast Iron	Cast Iron
Cylinder Head Material		Cast Iron	Cast Iron
Piston Rings		2 Compression/1 Oil	2 Compression/1 Oil
Bore	in. (mm)	2.67 (68)	3.07 (78)
Stroke	in. (mm)	2.83 (72)	3.30 (84)
Displacement	CID (CC)	47.84 (784)	61.39 (1006)
Compression Ratio		23.0:1	18.0:1
Horsepower 60/50 Hz	hp	10.1/8.4	12.9/10.7
RPM 60/50 Hz	RPM	1800/1500	1800/1500
Direction of Rotation (as viewed from generator end)		Counterclockwise	Counterclockwise
Lubrication System		Pressure	Pressure
Lube Oil Capacity (w/filter)	qt. (L)	3.2 (3)	5.5 (5.2)
Oil Recommendation (API)		CD, CDCC, or CC	CD, CDCC, or CC
Engine Firing Order (#1 cylinder nearest to flywheel)		1,3,2	1,3,2
Combustion System		Indirect	Indirect
Battery Voltage		12V	12V
Fuel Pump Priming		Electric	Electric
Max. Recommended Fuel Pump Lift	ft (m)	3.5 (1.067)	3.5 (1.067)
Coolant Capacity U.S. (approx.)	qt (L)	3 (2.84)	3.5 (3.31)
Recommended Coolant Ratio		50%	50%
Thermostat		160°	160°

Chapter 3 Operation

3.1 Prestart Checklist

⚠CAUTION

Before performing any prestart checks or inspections, refer to the Safety Precautions and information at the front of this manual.

Check or inspect the following items before startup and at the intervals specified in the service schedule (see the Maintenance section on page 4-1).

- **Air Cleaner**—check that the element is installed and clean to allow clean air to flow through the engine.
- **Air Inlets**—keep clean and free from obstructions.
- **Air Shrouding**—keep tight and in position.
- **Battery**—check electrolyte level and make sure battery connections are tight. For additional care and maintenance, refer to the battery manufacturer's instructions.
- **Coolant**—check the coolant level; if necessary, add fresh coolant until level is just below the overflow tube opening or mark.
- **Alternator Belt**—check belt condition and tension of the alternator belt.
- **Exhaust System—check for any leaks** and keep the exhaust outlet free from obstruction. Check that the silencer and piping are tight and in good condition.
- **Fuel Level**—check fuel level and keep tank(s) full to ensure adequate fuel supply.
- **Oil Level**—do not overfill. Keep the oil level at or near the full mark on the dipstick.
- **Operating Area**—check that the air intake area is kept clean and that the flow of cool air is unobstructed. Make sure that the area surrounding the generator set is clean and free from tools, rags, debris, etc.
- **Seawater Pump Priming**—before initial startup, prime the seawater pump. Close the seacock and remove the hose from the water filter outlet. Fill the hose and pump with clean water, then reconnect hose and open seacock. On startup, observe water discharge from the exhaust outlet to verify pump operation.

3.1.1 Filling the Fuel Tank

Fill the fuel tank with the specified fuel oil. The fuel oil tank should be about 90% full, and should not be over-filled.

3.1.2 Bleeding the Fuel System

To prevent starting problems or erratic operation, bleed the fuel system if the following conditions are present: the generator has run out of fuel, air leaks have developed in the system's suction side, or the fuel filter/water separator has been replaced.

NOTE: Connect the battery during the priming procedure to provide power to the fuel pump switch.

1. Loosen the vent screw (see Figure 3.1).

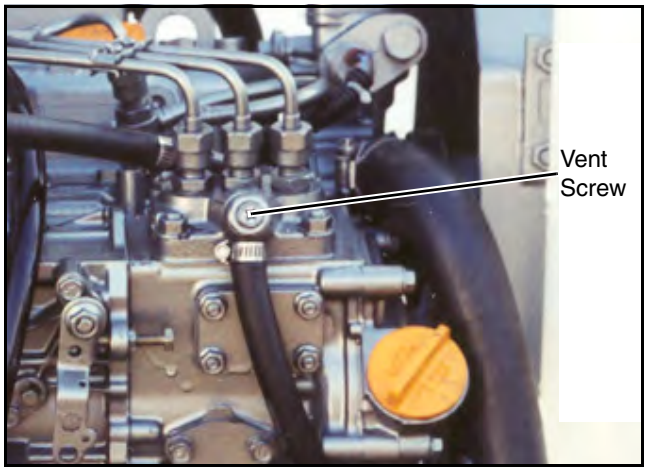


Figure 3.1 Bleeding the Fuel System

2. Locate the small momentary push button on the side of the generator set electrical box (see Figure 2.1).
3. Press and hold the button to run the fuel pump.
4. Run the pump until air bubbles stop appearing at the bleeder fitting.
5. Tighten the fitting before running the engine.

NOTE: After bleeding the fuel system, be sure to clean up any diesel fuel spills.

NOTE: If the fuel system has been completely emptied it may be necessary to loosen the injector line compression nut on top of the injectors 1/2 turn, then crank the engine over briefly until air stops coming out around the fuel line. Then tighten the compression. Close the seacock during this procedure. Open seacock after bleeding procedure is complete.

3.1.3 Oil Check

Check the oil in the crankcase daily or before each startup to ensure the level is in the safe range. Refer to Figure 3.2 to locate the dipstick.

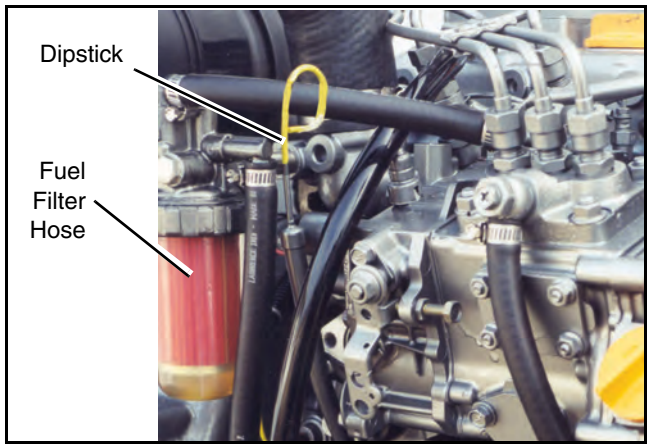


Figure 3.2 Oil Dipstick Location

To check the oil remove the dipstick (yellow handle) and wipe the end clean, reinsert it as far as possible and remove. Maintain the oil level between the MIN and MAX marks on the dipstick (see Figure 3.3).

NOTE: Do not operate the generator set if the oil level is below the MIN mark or above the MAX mark.

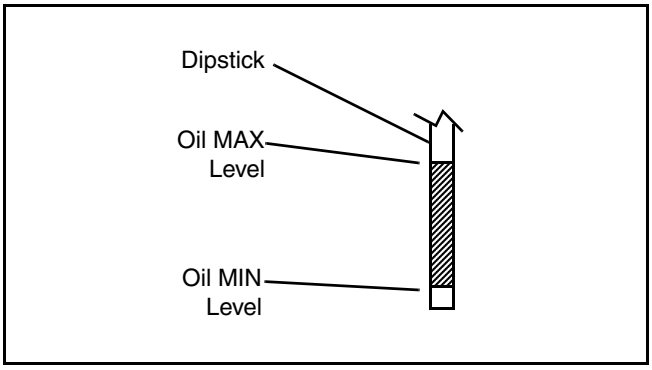


Figure 3.3 Dipstick Oil Level Check

3.1.4 Replenishing the Lube Oil

Level the generator set and fill the oil pan with the recommended lube oil.

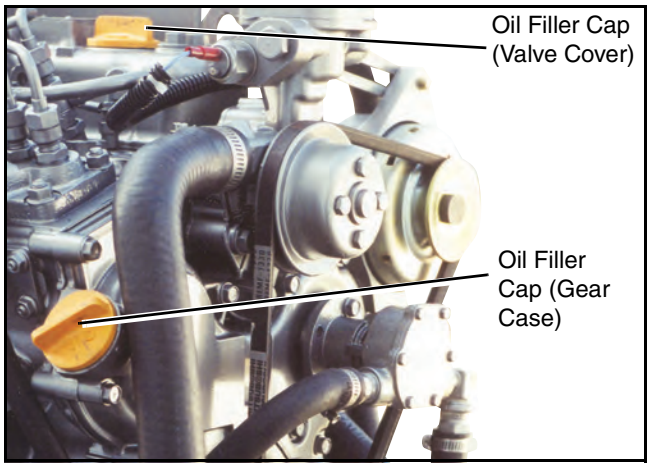


Figure 3.4 Filling the Lube Oil

1. Remove the filler cap from the filler port on the top of the valve cover or at the gear case, and fill the lube oil using a funnel (see Figure 3.4).
2. Fill the lube oil up to the max level mark on the dipstick.
3. After the lube oil is replenished, reinsert the dipstick into its original position and tighten the filler cap in the filler port.

NOTE: After replenishing the lube oil, be sure to thoroughly clean up any spills.

3.1.5 Filling the Fresh Water Cooling System

To fill the system with fresh water coolant, use the following procedure:

1. Check that the two fresh water drain cocks are tightened firmly. The drain cocks are color coded red. One is located on the exhaust manifold and the other is on the service side of the engine block (see Figure 2.1). Remove the fresh water pressure cap by turning it counterclockwise 1/3 of a turn (see Figure 3.5).
2. Fill the fresh water/long life coolant (LLC) mixture up to the lip of the filler port.

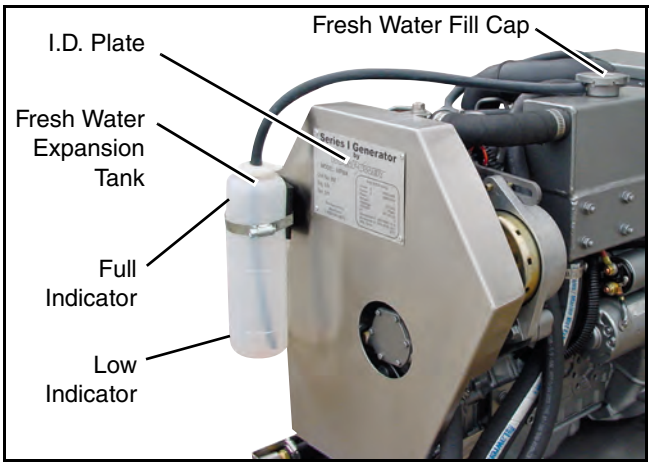


Figure 3.5 Fresh Water Coolant Filling Levels

NOTE: Pour the coolant slowly, using a funnel in such a manner that no bubbles are formed.

3. Replace and tighten the cap by turning it 1/3 clockwise.
4. Remove the water filler cap of the expansion tank and add the fresh water/LLC mixture up to the upper marking (Full) (see Figure 3.5). After filling, replace the cap.

3.2 Controller Operation

3.2.1 Controls and Indicators

Name	Description
Start/Stop Switch	Ensure main power switch is on. Press yellow manual button to start at generator. Press yellow auto switch to activate remote start.
AC Circuit Breaker (standard)	The circuit breaker trips when a fault occurs in the output circuit. During maintenance of craft or generator set wiring, the circuit breaker disconnects the generator set. Place the circuit breaker(s) in the ON position to close the circuit breaker.
DC Circuit Breaker or Fuses	The circuit breaker or fuses fail when a fault occurs in the controller circuit. After a fault correction, check fuses in the control box.
Remote Start Connector	A connector on the controller's back panel allows the connection of (optional) remote start kits.
Hourmeter	The meter records total generator set operating hours for reference in maintenance scheduling.

3.3 Starting the Engine

Before operating the engine, check that the rotational parts are free from obstructions.

1. Turn the fuel cock to "OPEN" (see Figure 3.6).

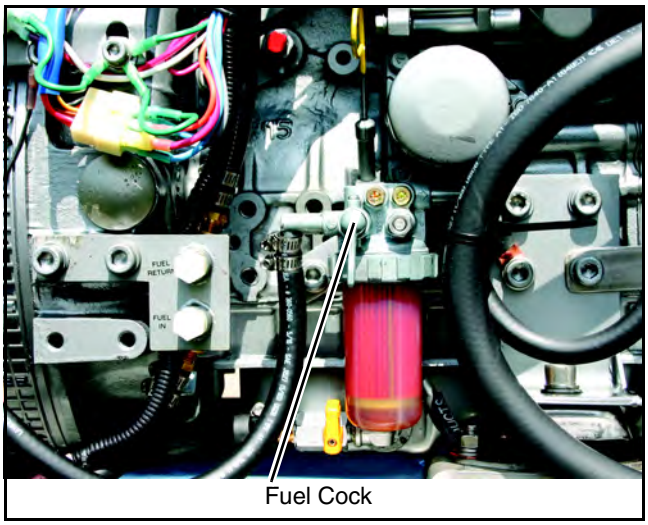


Figure 3.6 Opening the Fuel Cock

2. Make sure Main DC Power Switch is on.
3. Press yellow Manual Button to START at the generator (see Figure 3.7).
4. Press yellow AUTO to activate Remote Start.
5. There will be a few seconds starting delay for pre-heat.

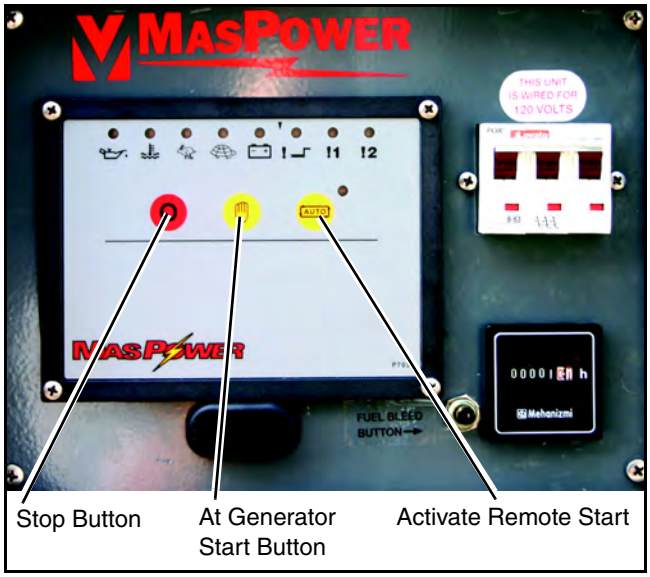


Figure 3.7 Starter Switch

⚠ CAUTION

PROTECTING THE BATTERY

Do not run the starter motor for more than 15 seconds at a time. If the engine can't be started, wait for approximately 30 seconds before using the starter again.

⚠ CAUTION

ENGINE RESTARTING

Be sure to check that the flywheel has come to a standstill before turning the starter switch to "START."

- The starter motor of flywheel gear may be damaged if the starter switch is operated with the flywheel still moving.
- Engines with a safety relay in the circuit can't be restarted unless the starter switch has been turned off once the starter motor is running.

3.3.1 Cautions During Engine Operation

During engine operation check the following items:

1. **Exhaust Color.** Black exhaust indicates that the engine is under strain. Continued operation will shorten the lives of the engine. Stop engine operation when black exhaust is emitted.
2. **Water and Oil Leakage.** Check that there are no water, oil, or combustion gas leaks, loose bolts and abnormal noise, overheating and excessive vibrations. If any abnormality is found, stop the engine and contact your nearest Yanmar dealer.
3. **Alarm Lamps**
   - ***Low Oil Pressure Alarm Lamp ("OIL")***
     If the low oil pressure alarm lamp illuminates or is lit while the engine is running, check whether the lube oil is too low. If not, there is an abnormality in the lube oil circuit. Continued operation will cause engine seizure. Stop the engine as soon as possible, and consult your nearest Yanmar dealer.

     NOTE: To check the lube oil level, stop the engine and wait for at least 3 minutes.
   - ***Charge Alarm Lamp ("CHG")***
     If the charge lamp illuminates while the engine is running, there is a fault in the charging circuit or with the fan belt (slippage or damage). Stop the engine and check. If the fan belt condition is satisfactory, contact your nearest Yanmar dealer.

⚠ CAUTION

- Do not check the coolant level while the engine is still hot. Steam or hot water may burst out if the radiator cap is removed too soon after the engine is stopped.
- Before removing the pressure cap, stop the generator set and allow it to cool then proceed.
- When removing the coolant cap, turn your face well away and cover the cap with a cloth. Turn the cap slowly to gently release the pressure inside the radiator.

- ***Cooling Water Temp Alarm Lamp ("WATER")*** If the cooling water temperature alarm lamp illuminates during load operation of the engine, the engine is overheated. Stop the engine immediately and check the fan belt tension and the cooling water level. If both are satisfactory, contact your nearest Yanmar dealer.

If shutdown occurs because of any of the above failures, the alarm lamp will remain illuminated.

3.4 Starting the Generator

With an operator present, once each week operate the generator set under load for one hour.

The operator should perform all of the prestart checks before starting the generator. Start the generator set according to the procedure in the Controller section of this manual. While the generator is operating (under load), listen for a smooth-running engine and visually inspect the generator set for fluid or exhaust leaks.

3.5 Stopping the Engine

3.5.1 Procedure

- Before stopping the engine, run the engine under no load for approximately 5 minutes.
- After stopping the engine, close the fuel cock.
- Wipe off and clean the engine.
- Turn off the battery switch (if your engine has one).

⚠WARNING

EMERGENCY STOP

If the engine can't be stopped with the engine stop lever (or the speed control lever), or the engine speed can't be lowered by the speed control lever, stop the engine as follows:

a. Block off the air supply

b. Shut off the fuel cock

c. Loosen all the nuts on either the fuel injection pump side or the fuel injection nozzle side. This cuts off the fuel supply, and the engine stops.

In such cases, contact your nearest Yanmar dealer to locate the causes and have them repair the engine.

3.6 Remote Panel Controllers

3.6.1 Remote Start

The remote start options allow starting and stopping from a location removed from the location of the generator set. The illuminated gauges include the engine oil pressure gauge and water temperature gauge. Standard Series I generator sets come equipped with a connector on the controller for to connect the panel kit. (Refer to Figures 3-8, 3-9, and 3-10.)

Figure 3.8 Remote Four Meter Panel Controller (analog)

Figure 3.9 Remote Panel Controller (digital)

Figure 3.10 Remote Start Panel with Hourmeter and Indicator Lights

3.6.2 Remote Panel Gauge Operation (optional)

If the generator set has an optional remote panel with gauges, observe the gauges upon engine start up (see Table 3.1). If gauge readings are not within the ranges specified, contact an authorized service distributor/dealer.

Table 3.1 Gauge Operating Ranges

Gauge	Normal Operating Range
Oil pressure	40–60 psi (276–414 kPa)
Water temperature	170–195°F (77–91°C)
DC voltmeter	12–14 volts

Chapter 4 Scheduled Maintenance

⚠ CAUTION

Before performing any maintenance procedures, refer to the Safety Precautions and information at the front of this manual.

4.1 General

Most of the scheduled maintenance deals with servicing the engine. Under normal conditions, the generator portion of the Series I generator set does not require service on a regular basis.

4.2 Routine Maintenance

Refer to the Table 4.1, Maintenance Schedule and the hourmeter located on the generator set controller to determine when to schedule routine service.

NOTE: Generator sets that are subject to extreme weather or dusty or dirty conditions should be serviced more frequently. Dry compressed air should be used at frequent intervals to blow the dust and dirt out of the generator portion.

Table 4.1 Maintenance Schedule

Service to be Performed (indicated by ✓)	Before Starting	Every 50 Hrs or 1 Month	Every 150 Hr	Every300 Hr	Every 600 Hr
LUBRICATION SYSTEM					
Check the crankcase oil level and add oil as necessary	✓				
Replace the oil in the crankcase		✓ (First)	✓		
Replace the lube oil filter element		✓ (First)	✓		
Check oil pressure warning lamp	✓				
FUEL SYSTEM					
Check the fuel level and refill	✓				
Check injection spray conditions					✓
Check injection timing					✓
Replace the fuel filter			✓		
INTAKE/EXHAUST SYSTEM					
Inspect the exhaust system components	✓				
Check the exhaust gas condition. If the exhaust is blue or black, contact your local distributor/dealer	✓ (During operation)				
Clean the intake silencer element			✓		

Table 4.1 Maintenance Schedule (Continued)

Service to be Performed (indicated by ✓)	Before Starting	Every 50 Hrs or 1 Month	Every 150 Hr	Every300 Hr	Every 600 Hr
Replace the intake silencer element					✓
Inspect the exhaust/water mixing elbow				✓	
Check the breather pipe for obstructions				✓	
Inspect the complete exhaust system					✓
COOLING SYSTEM					
Check the coolant level and fill as necessary	✓				
Check the seawater inlet and outlet	✓				
Adjust the tension of the cooling water pump belt tension if applicable				✓	
Check the function of the siphon break, if equipped			✓		
Check/replace the seawater pump impeller				✓ (Check)	✓ (Replace)
Replace the coolant					✓
Check/replace zinc anode				✓ (Check)	✓ (Replace)
ELECTRICAL SYSTEM					
Check battery electrolyte level	✓				
Adjust the alternator driving belt tension		✓ (First)	✓		
Check and tighten the electrical connections		✓			
Clean the battery cables					✓
ENGINE AND MOUNTING					
Check for water, fuel, coolant, and oil leakage	✓ (After operation)				
Check the mounting bolts and tighten if necessary				✓	
Adjust the intake/exhaust valve clearance					✓
Check the compartment for fuel, oil, or water leaks	✓				
Check isolator mounts				✓	
GENERATOR					
Test run the generator set		✓ (Weekly)			
Keep generator free of dust					✓

4.3 Lubrication System

4.3.1 Specifications

We recommend the following lubricating oil.

- Use Class CD or better (Service Classification of API-STD).
- Select a viscosity index according to the atmospheric temperature (see Figure 4.1).
- Lube oil with 15W-40 can be used throughout the year.

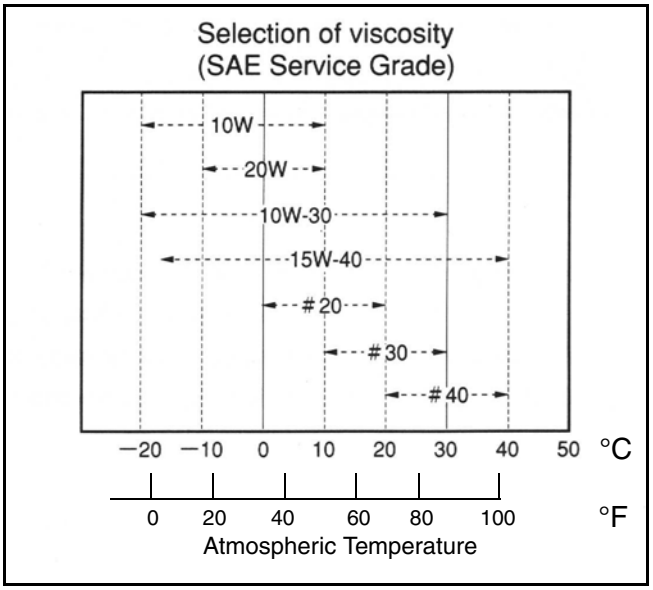


Figure 4.1 Oil Viscosity Chart

4.3.2 Checking the Lube Oil Level

Use the lube oil specified in this manual. Using a low-quality lube oil will cause early wear on the engine's moving parts, and adversely affect the durability of the engine.

Do not fill the lube oil over the specified level. Overfilling may cause the following problems:

- The engine speed may increase excessively under no load, resulting in engine breakdown.
- Foreign matter (carbon, etc.) may adhere to the piston causing damage to the cylinder or causing the piston rings to get stuck. The oil may also leak.

Level the engine before checking or replenishing the lube oil. A proper check cannot be made if the engine is tilted. Over filling or under filling the lube oil may cause damage to the engine.

4.3.3 Changing the Lube Oil

To replace the lube oil, use the following procedure.

NOTE: The lube oil can be drained quickly and easily when the engine is still warm after running.

1. To drain the oil, turn the yellow drain valve handle to the open position (see Figure 4.2).

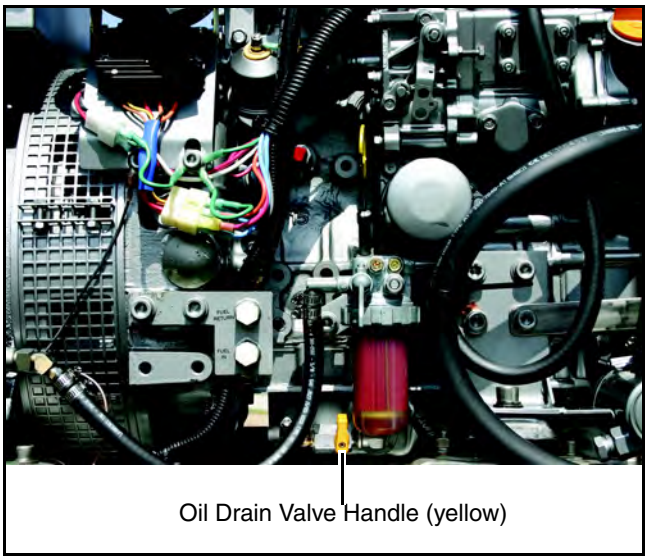


Figure 4.2 Oil Drain Valve Handle Location

2. Drain the oil into a waste oil can.
3. Allow ample time for oil to drain. After completing the draining process, turn the oil drain lever to the fully closed position.
4. Remove one of the two oil fill caps (see Figure 4.3).

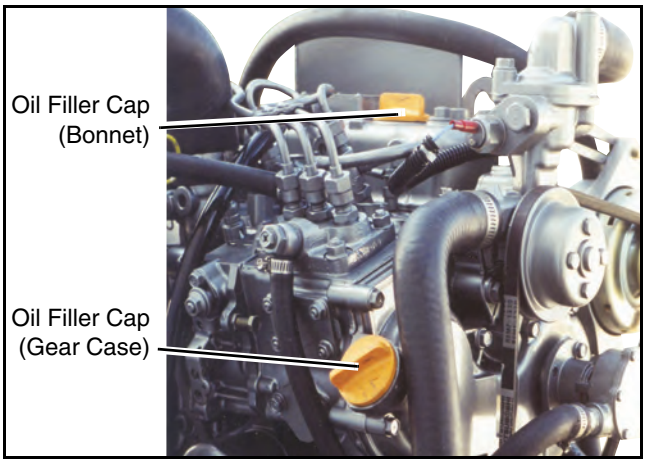


Figure 4.3 Oil Fill Cap Locations

5. Using a funnel, fill the engine to the proper level with the proper oil type and viscosity.
6. Replace the oil fill cap.

4.3.4 Changing the Lube Oil Filter

To change the filter, use the following procedure (see Figure 4.4).

1. Loosen the oil filter by turning it counterclockwise with a filter wrench. Clean up any spilled oil.
2. Clean the contact surface of the oil filter seat.

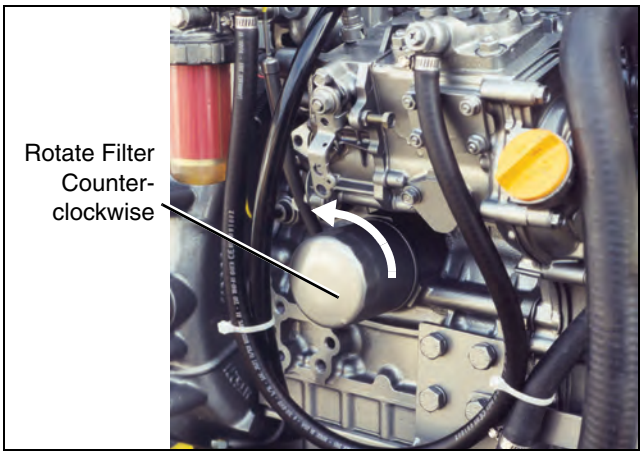


Figure 4.4 Oil Filter Replacement

3. Lightly lubricate the O-ring surface of the new filter with fresh oil. Thread the filter on until the O-ring makes contact, then hand-tighten an additional one-half turn.
4. Start the generator and check for oil leaks.
5. Stop the generator. Remove the dipstick and wipe it clean. Reinsert the dipstick then remove it to check the oil level. Add oil as necessary to bring the level up to the MAX mark on the dipstick.

4.4 Fuel System

Be sure to use the diesel fuel [ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No. 45 min.)] most suitable for engine performance.

4.4.1 Selecting the Proper Fuel Oil

In cold weather, select the fuel oil of appropriate properties according to the ambient temperature. Use of low-quality or non-specified fuel oil can cause the following:

- start-up trouble, insufficient output, or excessive smoke.
- an increase in thermal load due to poor combustion, or excessive wear on the engine's moving parts due to foreign matter.
- fuel oil can freeze and no output will be produced.

4.4.2 Replacing the Fuel Filter

Clean or replace the fuel filter as described in the procedure below (see Figure 4.5).

1. Close the fuel cock on the pipe line.
2. Remove the collar from the fuel filter adapter while holding the filter bowl in place.
3. Remove the filter bowl and filter element.

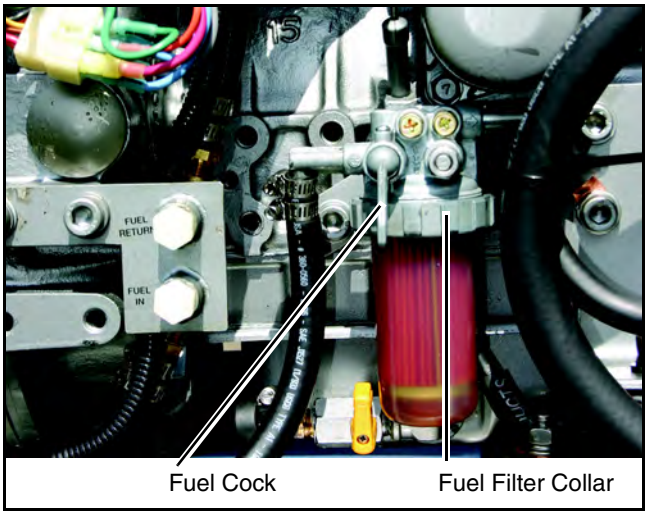


Figure 4.5 Fuel Filter Replacement

4. If the filter element is damaged, replace it.
5. Wipe off all the parts with a clean rag. Inspect all mating surfaces and threads for damage, replace as necessary.
6. Place the fuel filter element into the fuel filter bowl and lubricate the rubber seal with fresh fuel oil.

> **⚠ CAUTION**
>
> Do not use gasoline to clean the element.

7. Slide the collar against the bowl flange, position the fuel filter up against the adapter and hand-tighten the collar.
8. Open the fuel cock.

NOTE: Bleed the fuel system after replacing the filter and run the engine to check for fuel oil leakage.

4.4.3 Checking for Oil Leakage

When the lube oil and filter have been replaced, be sure to run the engine to check for leaks at the lube oil drain plug and filter connection. Also, check the oil level 15–20 minutes after the engine is stopped and replenish oil if necessary.

4.4.4 Bleeding the Fuel System

Refer to Section 3.1.2 for the proper procedure to bleed the fuel system.

4.5 Intake System

In the intake and exhaust systems, resistances to intake air flow and exhaust gas flow are generated. The limits shown in the tables below must be observed to ensure engine performance.

The initial upper limits here refer to allowable resistances when the parts in the intake and exhaust systems are new. As the engine is used, the resistances increase due to deposits in the air cleaner and muffler. The upper limits for air cleaner replacement and exhaust system cleaning (including the exhaust tube and muffler) are the limit values for operation. See Tables 4.2 and 4.3 for intake and exhaust specifications.

Table 4.2 Allowable Depression at Engine Manifold

Applicable Model	Allowable Depression at Engine Manifold ≦ kPa (mm H_2O)	
	Initial Upper Limit	Upper Limit for Air Cleaner Replacement
All TNE series	2.45 (250) (9.5 in/H_2O)	6.23 (635)

Table 4.3 Allowable Exhaust Back Pressure

Applicable Model	Allowable Exhaust Back Pressure ≦ kPa (mm H_2O)	
	Initial Upper Limit	Upper Limit for Exhaust System Cleaning
2TNE68-N 2TNE68	5.88 (600)	7.06 (720)
3TNE66-N 3TNE68-N 3TNE68 3TNE72-N	9.81 (1000)	11.77 (1200)
3TNE74-N 3TNE74	11.77 (1200)	14.12 (1440)
3TNE78A 3TNE82A	9.81 (1000)	11.77 (1200)
3TNE84 3TNE88 4TNE84 4TNE88	6.37 (650)	7.65 (780)
3TNE84-T 4TNE84-T	4.90 (500)	5.88 (600)
4TNE94 4TNE98	9.81 (1000)	11.77 (1200)

4.5.1 Checking the Air Intake Silencer

Check the air intake silencer according to the recommended intervals on the maintenance schedule, using the following procedure.

NOTE: If operating in areas that are particularly dirty or dusty, check the silencer more frequently.

1. Release the spring clips to remove the silencer cover and check the element (see Figure 4.6).
2. If the element is dirty, rusty, or damaged, replace it.
3. Clean the cover and reattach the spring clips.

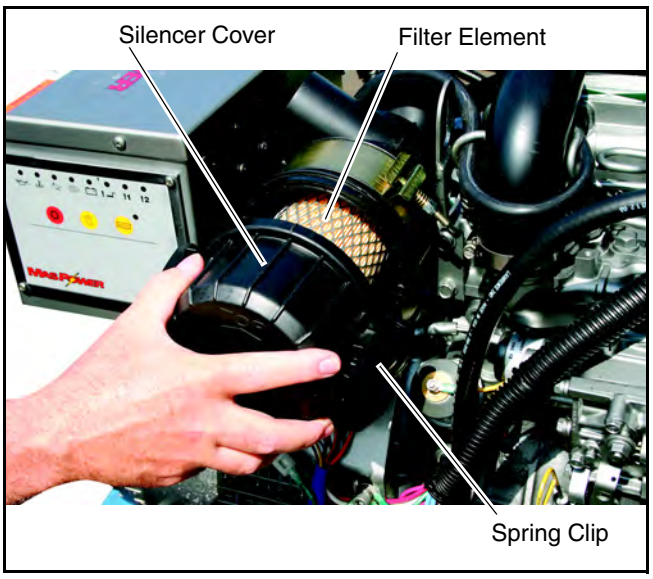


Figure 4.6 Cleaning the Intake Silencer

4.5.2 Checking the Mixing Elbow

The mixing elbow combines high temperature exhaust and cool seawater. In an improperly maintained exhaust system, this mixture can cause rapid deterioration and failure due to engine vibration.

1. Check for carbon accumulation or corrosion inside the mixing elbow.
2. Use a wire brush to clean off any carbon accumulation.
3. Check the exhaust manifold mounting threads for the presence of corrosion or cracks.
4. If the mixing elbow or any exhaust components are damaged, replace them to prevent carbon monoxide leakage in the engine.

4.6 Cooling System

4.6.1 Cooling Fresh Water

Use clean water (distilled is recommended) and be sure to add long life coolant (LLC) to prevent rust buildup and freezing.

NOTE: The use of hard or dirty water may corrode or block the cooling passages, affecting the engine durability.

4.6.2 Long Life Coolant

Select a good quality “long life coolant.”

The use of fresh water without LLC will cause rust or water scale to form in the water passage (such as the cylinder jacket), affecting the cooling performance. In addition, an increase in thermal load may cause early wear on the engine’s moving parts, affecting the engine durability. During cold weather, the cooling water may freeze, damaging parts in the cooling water passages.

4.6.3 Mixing Ratio of Cooling Fresh Water and LLC

Determine the mixing ratio of the fresh water and LLC according to the ambient temperature by following the coolant manufacturer’s specifications.

If the water to LLC ratio is insufficient, the rust preventive effect will diminish. Conversely, an excessive amount of LLC will adversely affect the engine’s cooling performance and an increase in thermal load will cause damage to the moving parts.

4.6.4 Procedures for Checking the Cooling Water

Check the water level of the expansion tank on a daily basis. The water level, when the engine is cold, should be between the upper and lower limits (see Figure 4.7). If it is low, replenish with a mixture of fresh water and LLC.

Check for any change in the water level before and after operation. Under normal conditions, the water level fluctuates as follows:

— Before operation (cold state): lower level

— Immediately after stop (warm state): higher level

NOTE: If the water levels in the expansion tank before and after operation are the same, check the following points:

1. With the engine cool, open the pressure cap of the main tank and check the amount of water.
2. Check the hose connected between the main tank and the expansion tank: Ensure that the hose clips are tight and the hoses are free of cracks.
3. Check the water leakage from the periphery of the engine.
4. If the cause of the problem is still not clear contact your local dealer.

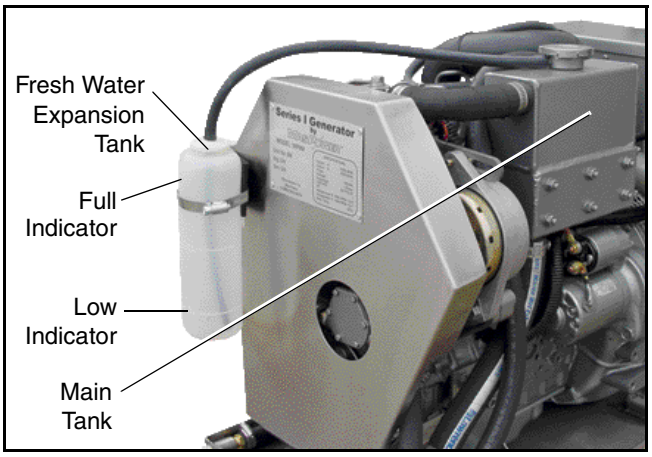


Figure 4.7 Fresh Water Cooling Tank

4.6.5 Changing the Fresh Water Coolant

The fresh water coolant should be changed only after the engine has sufficiently cooled.

1. Prepare a drain can.
2. Remove the cap of the expansion tank.
3. Remove the pressure cap of the fresh water drain tank.
4. Open the red drain cock (see Figure 4.8). Drain the cooling water from the expansion tank.
5. Finally, tighten the drain cock.
6. Replenish the fresh water coolant in the main tank and the expansion tank to the proper levels.

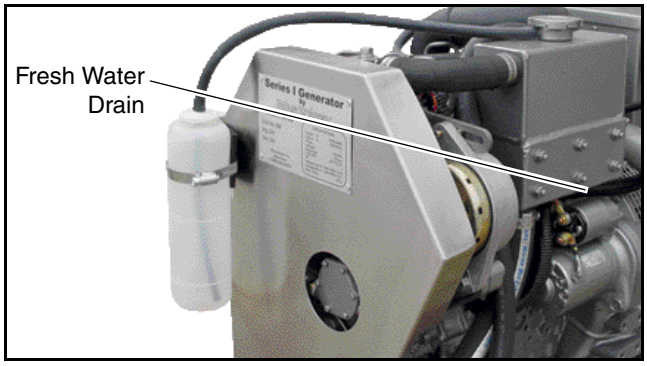


Figure 4.8 Drain Location for Fresh Water

4.6.6 Fresh Water Coolant Level and Water Leakage Checks

1. On completion of the change of cooling water, be sure to run the engine until the water temperature increases to a proper value 76–185°F (80–85°C). Check for water leakage.
2. Stop the engine. Wait for the cooling water to cool down and check the water level in the expansion tank. Replenish cooling water as necessary.
3. Finally tighten the cap of the expansion tank securely.

4.6.7 Alternator/Water Pump Belt (V Belt)

1. If the belt tension is loose, the belt will slip to cause poor battery charging and insufficient flow rate of the water pumps, resulting in engine overheat. Check and adjust the V-belt tension as described in the procedure below (see Figures 4.9 and 4.10).

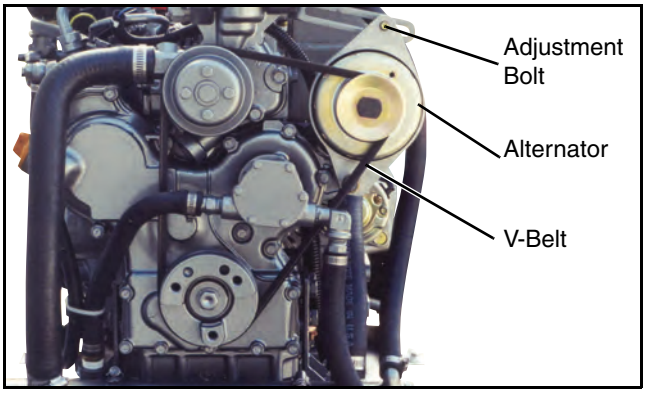


Figure 4.9 Alternator/Water Pump Belt

2. Make a visual check. If the V-belt is scratched, cracked or worn, replace it with a new one.
3. Apply a force of approximately 98 N (10 kgf) to the center of the V-belt with fingers or using a belt tension gauge to check the deflection of the V-belt. Deflection should be 3/8–5/8 in. (10–15 mm).

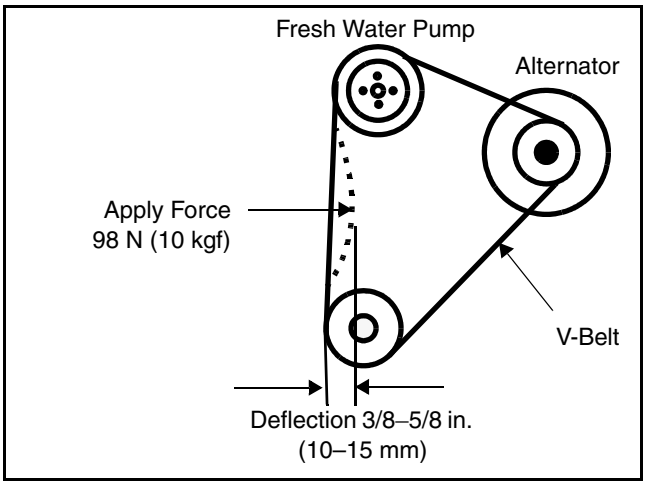


Figure 4.10 Adjusting Belt Tension

4. Adjust the V-belt tension, as required. Loosen the bolt and nut (see Figure 4.9) to move the alternator outward and make an adjustment. On completion of adjustment, tighten the bolt and nut securely.

NOTE: Avoid damage to the alternator. During adjustment, take care not to damage the stator coil or the through bolt.

NOTE: Avoid excessive V-belt tension. Any excessive tension may cause damage to the bearings of the alternator or water pump.

4.7 Electrical System

4.7.1 Checking the Battery

(customer-supplied)

1. Check the electrolyte level and replenish distilled water if the electrolyte level is too low.
2. If it is hard to start the engine when the electrolyte level is normal, recharge the battery.

4.7.2 Checking the Alarm Lamps

Check the correct functioning of the alarm lamps. If there is any abnormality, immediately stop the engine and contact your nearest Yanmar dealer.

The following lamps will illuminate only when there is a fault.

- Low oil pressure
- High temperature
- Engine overspeed
- Engine underspeed
- Low battery voltage

4.8 Engine

4.8.1 Adjusting the Engine Speed

The governor maintains constant engine speed by adjusting the fuel supplied to the engine. The governor is factory-adjusted, and generally needs no further service or adjustment. To adjust the speed setting, perform the following:

1. Loosen the locking nut on the speed adjusting screw (see Figure 4.11).
2. Turn the screw clockwise to increase the speed and frequency.
3. To decrease speed, turn screw counterclockwise.
4. Tighten the locking nut at the new speed setting.

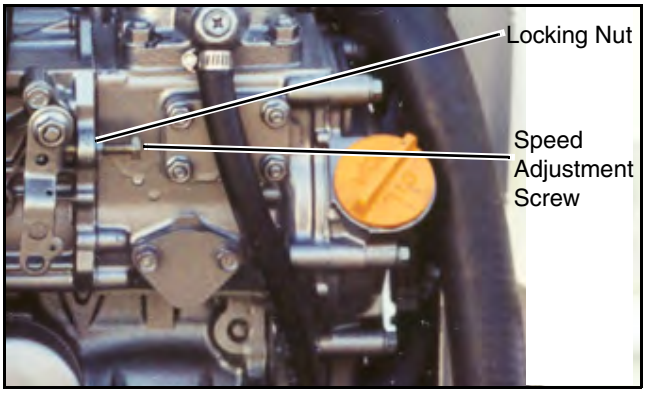


Figure 4.11 Governor Adjustment Screw

4.8.2 Storing the Generator Set

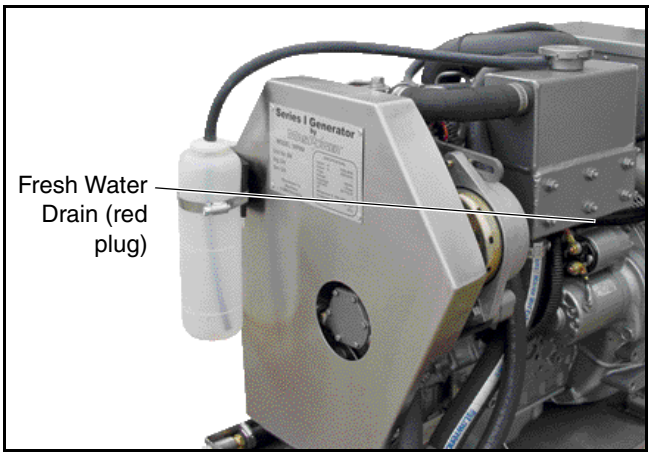
When storing the engine for a long time without using it, maintain the engine for future use.

1. Finish the periodic check and maintenance before storage if the date of it is approaching.
2. Start the generator and run it until it reaches operating temperature.
3. Stop the generator and drain the oil from the crankcase while the engine is still warm.
4. Change the oil filter and the fuel filter.
5. Refill the crankcase with the specified weight oil.

> **⚠ CAUTION**
>
> Wait until the engine has cooled down before extracting cooling water from the engine.

6. Be sure to drain water from the fresh water cooling system if anti-freeze is not used (see Figure 4.12).
7. Drain all the seawater from the cooling system and leave open. Shut before operations.
8. Drain the seawater from the stainer and the seawater pump.
9. Block air and exhaust ports.
10. Remove the batteries from the engine and charge them fully before storage. Charge the batteries every month during storage, because they run down naturally (self-discharge).
11. Cover entire unit with dust cover.

NOTE: If water is not drained, it may freeze and damage major parts of the water cooling system (fresh water cooler, oil cooler, water pumps, etc.)



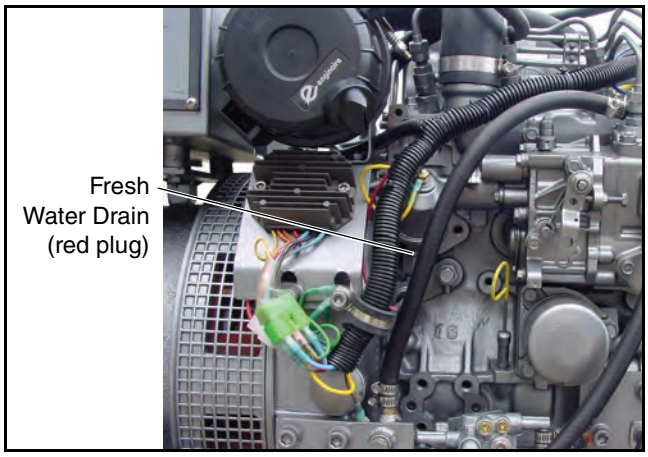


Figure 4.12 Location of Fresh Water Drains

Chapter 5 Troubleshooting

If a problem in encountered during operation, refer to Table 5.1 and take proper measures. Corrective action and testing often require knowledge of electrical and electronic circuits. To avoid additional problems caused by improper repairs, contact an authorized service distributor/dealer for service.

Table 5.1 Basic Troubleshooting Chart

Problem	Possible Cause	Corrective Action	Contact Authorized Dealer for Servicing
ENGINE FAILS TO START			
The starter fails to run or its speed is too low.	Drop in the battery voltage (battery discharge).	Check the battery electrolyte level.	
		Charge or replace the battery.	
		Check the electric circuit (leak).	
	Battery terminal disconnected, loosened, or corroded.	Clean. Retighten.	
	Poor grounding of the battery (loosened terminal, break)	Check and repair.	
	Battery switch not turned on.	Turn on the switch.	
	Poor alternator charging (alarm lamp turned on).	Check the cables between the alternator and battery.	
		Check the alternator for trouble.	
	Trouble with the starter switch	Check and replace.	
	Trouble with the starter.	Check and replace.	
	Oil's viscosity index too high.	Replace with oil having viscosity index suitable for ambient temperature.	
	Viscosity increased due to lube oil deterioration.	Check and replace.	
	Load imposed on the engine.	Remove the load from the machine to unload the engine.	
	Major moving parts such as piston and metal seized.	Completely disassemble and service the engine.	✓
The starter rotates but the engine does not start.	Fuel tank cock closed.	Open the cock fully.	
	No fuel oil in the fuel tank.	Replenish fuel oil.	
	Air trapped in the fuel oil system.	Bleed.	
	Fuel oil filter clogged.	Replace the fuel filter.	
	Engine stop solenoid malfunctioning (fuel oil shut off).	Check the electrical circuit.	
		Check and replace the engine stop solenoid.	✓

Table 5.1 Basic Troubleshooting Chart (Continued)

Problem	Possible Cause	Corrective Action	Contact Authorized Dealer for Servicing
ENGINE FAILS TO START (Continued)			
The starter rotates but the engine does not start. (Cont'd)	[In cold weather] Fuel oil viscosity too high for fuel to flow.	Replace with cold weather fuel oil.	
	[In cold weather] Fuel oil system frozen.	1. Warm the fuel tank, fuel filter, and fuel pipe, and drain the fuel oil from them. 2. Replace with the fuel oil for cold weather.	
	Trouble with governor lever.	Check and adjust.	✓
	No intake/exhaust valve clearance: gas leakage causing insufficient compression.	Readjust the valve clearance to specified value.	✓
	Poor fitting of intake/exhaust valve seat: gas leakage causing insufficient compression.	Overhaul the cylinder head.	✓
	Flaws on cylinder, worn or seized ring: resulting in poor compression.	Overhaul the piston.	✓
The engine stalls/ engine speed does not increase.	Air trapped in fuel oil system.	Bleed.	
	Fuel filter clogged.	Replace the fuel filter.	
	Intake silencer clogged (insufficient air quantity)	Clean or replace the element.	
	Trouble with the governor lever.	Check and adjust.	
Engine speed is abnormal (too high or too low, or fluctuating).	Trouble with the governor lever.	Check and adjust.	
	Trouble with the fuel valve, governor, and/or fuel pump.	Adjust and repair.	
The engine does not stop (the engine fails to stop even when the starter switch is used).	Engine stop solenoid malfunctioning (the fuel oil cannot be shut off).	Check and repair the electric circuit of the engine stop solenoid.	✓
		Check and replace the engine stop solenoid.	
No load can be imposed (output drop).	Fuel tank cock not opened fully.	Open the cock fully.	
	Fuel filter clogged.	Replace the fuel filter.	
	Air intake silencer clogged (insufficient air quantity).	Clean or replace the element.	
	Exhaust mixing elbow and/or exhaust pipe stained or clogged (increase in exhaust back pressure)	Check and clean.	
	Trouble with the governor lever.	Check and adjust.	
	Poor injection of the fuel valve.	Check and adjust.	

Table 5.1 Basic Troubleshooting Chart (Continued)

Problem	Possible Cause	Corrective Action	Contact Authorized Dealer for Servicing
ENGINE FAILS TO START (Continued)			
No load can be imposed (output drop). (Cont'd)	Excessive wear on the fuel pump plunger: insufficient fuel supply.	Overhaul the fuel pump.	✓
	Trouble with the fuel feed pump: insufficient fuel supply.	Check, and overhaul.	✓
	No intake/exhaust valve clearance: gas blowing by, or poor combustion due to a drop in the compression pressure.	Adjust the valve clearance to specified value.	✓
	Poor fitting of the intake/exhaust valve seat: gas blowing by or poor combustion due to a drop in compression pressure.	Overhaul the cylinder head.	✓
	Poor combustion due to contaminants in the piston top recess.	Overhaul the head.	✓
	Malfunctioning head gasket: gas blowing by.	Replace the head gasket.	✓
	Piston seized, worn or stuck ring, scratched or worn cylinder or wear: gas blowing by. Poor combustion due to a drop in compression pressure.	Measure the compression pressure.	✓
		Overhaul the piston.	✓
Exhaust gas color. *Black smoke.*	Poor spray condition of fuel injection valve.	Check and clean.	✓
	Poor combustion due to contaminants in the piston top recess.	Overhaul the head.	✓
	Air intake silencer clogged (insufficient air quantity).	Clean or replace the element.	
	Exhaust mixing elbow and/or exhaust pipe stained or clogged (increase back pressure).	Check and clean.	
	Intake air temperature too high (insufficient air quantity)	Measure the intake air temperature.	
		Check and clean the air inlet and air outlet (check the ventilation).	
		Check and clean the fresh water cooler; check the sea water flow.	
	No intake/exhaust valve clearance: gas blowing by or poor combustion due to a drop in the compression pressure.	Adjust the valve clearance to specified value.	✓
	Poor fitting of the intake/exhaust valve seat: gas blowing by or poor combustion due to a drop in the compression pressure.	Overhaul the cylinder head.	✓

Table 5.1 Basic Troubleshooting Chart (Continued)

Problem	Possible Cause	Corrective Action	Contact Authorized Dealer for Servicing
ENGINE FAILS TO START (Continued)			
Exhaust gas color. (Cont'd) *Black smoke.*	Piston seized, worn or stuck ring, scratched or worn cylinder: gas blowing by.	Overhaul the piston.	✓
White smoke.	Piston seized, worn or stuck ring, scratched or worn cylinder: excessive "Oil Up," allowing the oil to burn.	Overhaul the piston.	✓
	Flaws in the intake/exhaust valve stem, scratched or worn valve guide, or malfunctioning stem seal: excessive "Oil Down," allowing the oil to burn.	Replace the intake/exhaust valve stem seal.	✓
		Overhaul the cylinder head.	
Too much lube oil is consumed.	Too much oil in the oil pan.	Drain the oil until the oil level is below the upper limit of the oil level gauge.	
	Piston seized, worn or stuck ring, scratched or worn cylinder: excessive "Oil Up," allowing the oil to burn.	Overhaul the piston.	✓
	Flaws in the intake/exhaust valve stem, scratched or worn valve guide, or malfunctioning stem seal: excessive "Oil Down," allowing the oil to burn.	Replace the intake/exhaust valve stem seal.	✓
		Overhaul the cylinder head.	✓
The lube oil deteriorates too early.	Improper lube oil used.	Replace with the specified lube oil.	
	Piston seized, worn or stuck ring, scratched or worn cylinder: too much gas blowing by gas, allowing it to enter the lube oil.	Overhaul the piston.	✓
	Operation performed too long with the oil (in the oil pan) at a low level.	Replenish lube oil up to the upper limit of the oil level gauge.	
	Lube oil temperature too high (cooling water temperature too high).	Lower the cooling water temperature (see the cooling water temperature rise problem).	
Lube oil pressure too low (the alarm lamp lights up).	Oil shortage in the oil plan (below the lower limit of the oil level gauge).	Replenish a specified amount of oil.	
		Check for oil leakage.	
	Lube oil filter clogged.	Replace the lube oil filter.	
	Trouble with the oil pressure switch.	Check and replace the switch.	
	Trouble with the lube oil pressure-regulating valve and/or oil pump.	Overhaul.	
There is an increase in the cooling water temperature (the alarm lamp lights up).	Cooling water shortage in the water cooler (trapped air causes insufficient cooling).	Check and replenish.	

Table 5.1 Basic Troubleshooting Chart (Continued)

Problem	Possible Cause	Corrective Action	Contact Authorized Dealer for Servicing
ENGINE FAILS TO START (Continued)			
There is an increase in the cooling water temperature (the alarm lamp lights up). (Cont'd)	Fresh water and/or sea water pump drive belt loose.	Check and adjust.	
	Insufficient sea water flow.	Check and replace.	
	Trouble with the thermostat (no water flows on the fresh water side).	Sea water pump impeller damaged and/or sea water path clogged.	
	Fresh water and/or sea water path stained.	Clean the cooling water passage.	
	Trouble with the ventilating passage (ventilation).	Check and clean the air inlet and air outlet (ventilation).	
Too much cooling fresh water is consumed.	Check the cooling fresh water passage using a cap tester for water leakage.		
	Cooling water rubber hose damaged or hardened.	Check and replace.	
	Hose clip is too lose.	Retighten the clip.	
	Trouble with the pressure cap (water does not return to the fresh water cooler from the sub-tank).	Check and replace.	
	Rubber hose between the sub-tank and fresh water cooler damaged; hose clip loose (poor airtight-ness0	Check and replace or retighten.	
Severe engine vibration	Engine mounting bolts loose.	Check and retighten.	
	Un-uniformity combustion between cylinders.	Check and adjust the fuel valve injection pressure and injection spray conditions.	✓
		Check and adjust the intake/exhaust valve clearance.	✓
	Major moving parts such as cylinder, crank pin metal and crankshaft metal worn to cause an excessive clearance.	Overhaul the engine.	✓
Oil leakage from the crankshaft oil seal.	Blow-by gas passage blocked, resulting in an excessive increase in pressure in the crankcase.	Check and clean the blow-by gas passage.	
	Oil seal lip worn abnormally.	Replace the oil seal.	✓

Table 5.1 Basic Troubleshooting Chart (Continued)

Problem	Possible Cause	Corrective Action	Contact Authorized Dealer for Servicing
ABNORMAL SOUND IS HEARD			
High knocking is heard	Fuel injection timing too early.	Check and adjust to specified value.	✓
Valve hitting noise is heard.	Intake/exhaust clearance too large.	Check and adjust to specified value.	✓
High gear noise is heard.	Improper gear backlash.	Overhaul.	✓
High intake spitting is heard.	No intake/exhaust value clearance.	Check and adjust to specified value.	✓

Chapter 6 Installation

6.1 Introduction

We recommend that you contact your local dealer for installation of the Series I marine generator set. To handle the installation process, use this section as a guide, then refer to the operation section for specific service instructions. Reliable and safe generator set operation depends largely upon proper installation.

Marine generator set installations must comply with all applicable regulations and standards. See Appendix B Reference Material for governing agencies. Follow guidelines presented here in planning and making installations. Use specifications given only in initial planning. Use current dimension drawings and wiring diagrams.

6.2 Location (Refer to Figure 6.1)

When selecting an appropriate location for the generator set, consider the following:

- Ensure there is adequate space for ventilation, cooling, exhaust, and fuel system installation. Also, allow for service access to the unit.
- Available structural members must provide adequate support for the generator unit.
- The compartment must be sealed to prevent exhaust gases and fuel vapors from entering cabins.

⚠WARNING

Diesel generator sets are not ignition-protected. USCG Regulation 183.410 requires ignition-protected devices only in gasoline/gaseous-fueled environments.

6.3 Ventilation

Proper ventilation of fumes and gases must be considered during installation. Ventilation provisions must comply with the United States Coast Guard (USCG) regulations governing vent sizes and operator requirements.

1. As a general rule, the inlet and outlet vent sizes should be 2 sq. in. per ft (1.3 sq. cm/30.5 cm) of the craft's beam. If any screening of vents is used, then the opening measurements should be doubled. For continuous operation, ambient air temperature must not exceed 140°F (60°C).
2. Vent ducts should extend to the bilges to expel heavier-than-air fumes.
3. If the generator is to be mounted in the engine compartment, the airflow to the compartment should be increased to accommodate the generator's requirements.
4. Sniffer devices should be installed to generate alarms or engine shutdown, should dangerous fumes be detected.

6.4 Fuel Systems

Refer to Safety Section for precautions regarding fuel systems.

6.4.1 Fuel Supply

Do not modify the tank or gen-set engine fuel system. Tank and installation must conform to USCG Regulations.

Locate the fuel return line as far as practical from the fuel pickup. This allows tank fuel to cool return fuel before delivery back to the fuel injectors. Incoming fuel cools the injectors and achieves maximum engine efficiency by supplying cool fuel to the engine. Fuel tank capacity and amount of fuel will affect cooling capability.

6.4.2 Fuel Lines and Filters

Use 5/16 in. (7.9 mm) ID size customer-supplied fuel lines to connect to the fuel pump and fuel return. Fuel lines and fuel line supports must comply with USCG Regulations.

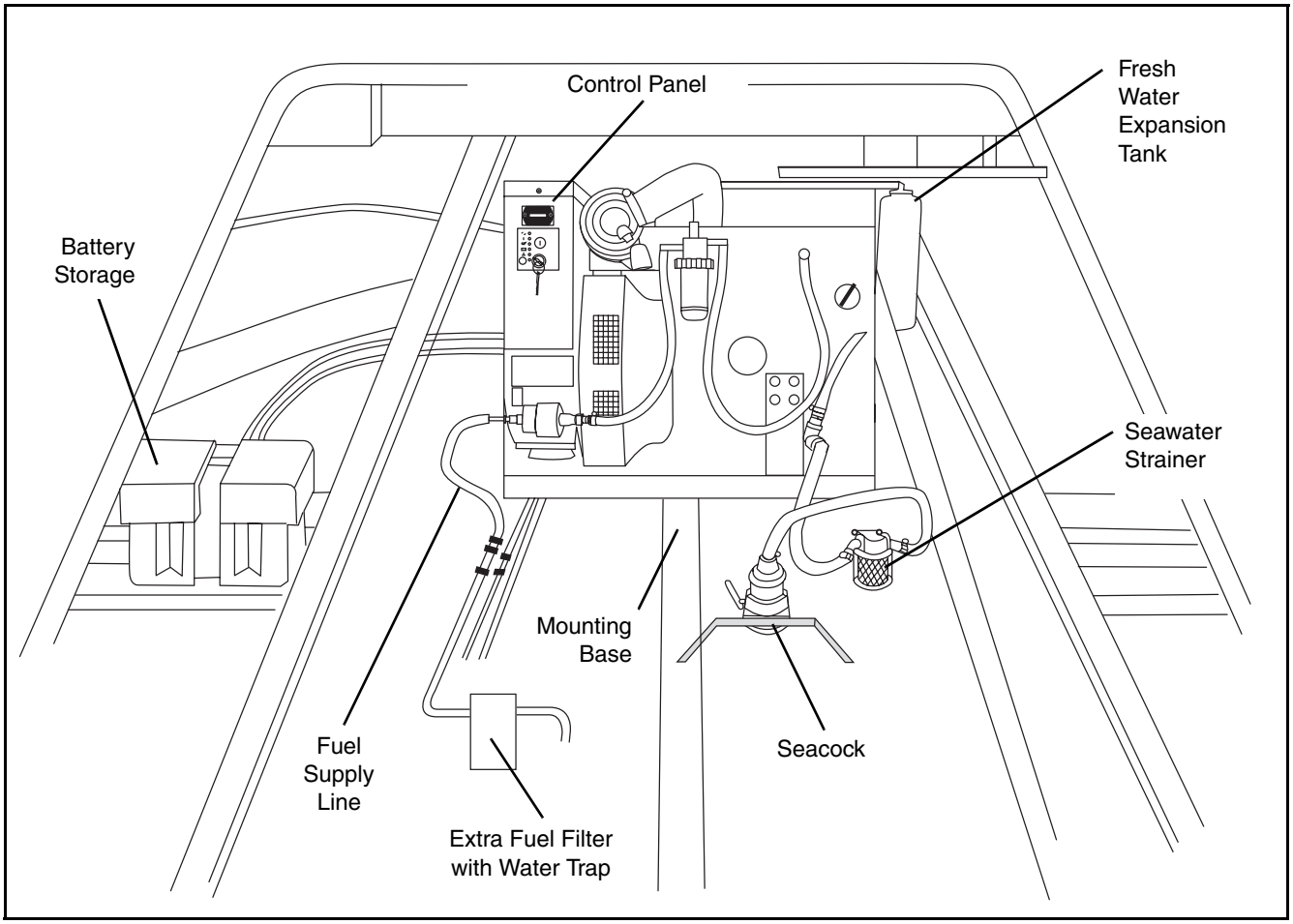


Figure 6.1 Typical Location and Mounting of the Generator Set

6.4.3 Extra Fuel Filter with Water Trap

The engine is provided with an element type fuel filter, but in order to eliminate water and dirt completely, use an extra fuel filter with a water trap. To attach extra fuel filter and water trap, select a suitable position in the piping between the fuel feed pump and the fuel oil tank. The position must be free of vibrations, and facilitate filter inspection and replacement (see Figure 6.3).

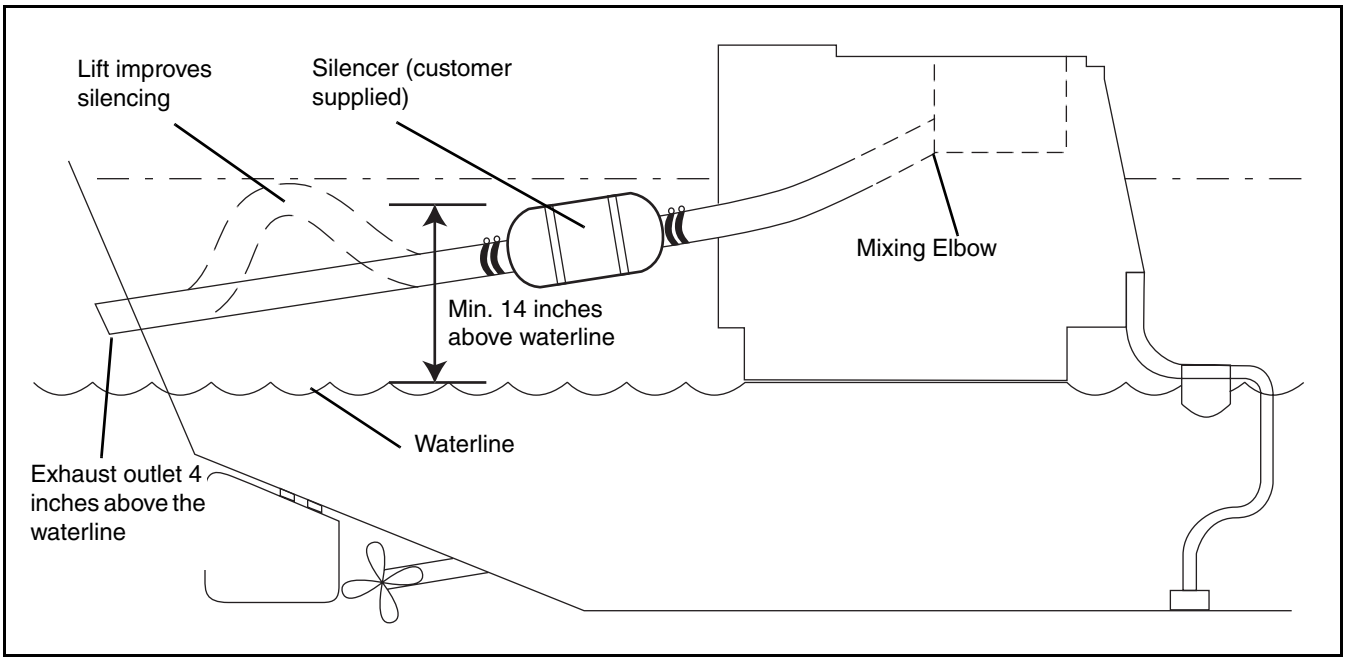
NOTE: Do not attach the extra fuel filter to the engine.

Required capacity for extra fuel filter:

PowerSource Model	Required Flow Rating GPH (L/H)
MP5.5M	3.6 (16.3)
MP8M	4.6 (20.9)

Use a filter element with a 30 micron rating.

Installation Above the Waterline



Installation Below the Waterline

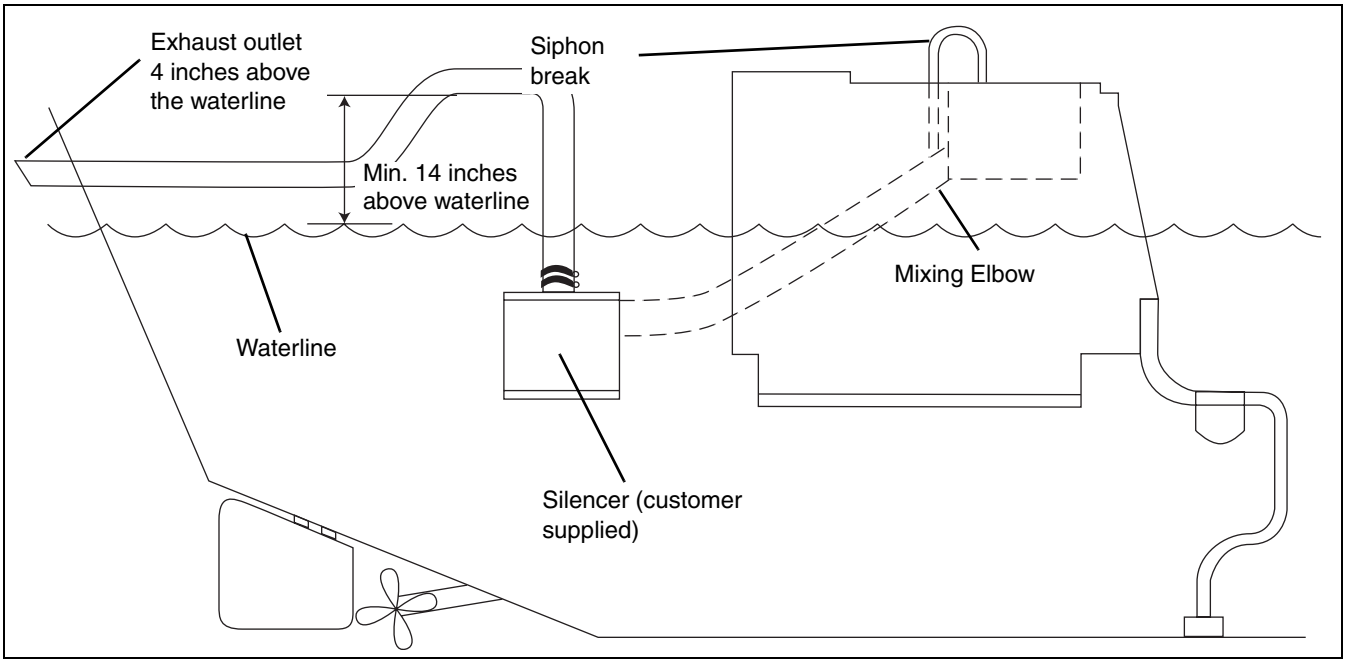


Figure 6.2 Exhaust System Installations

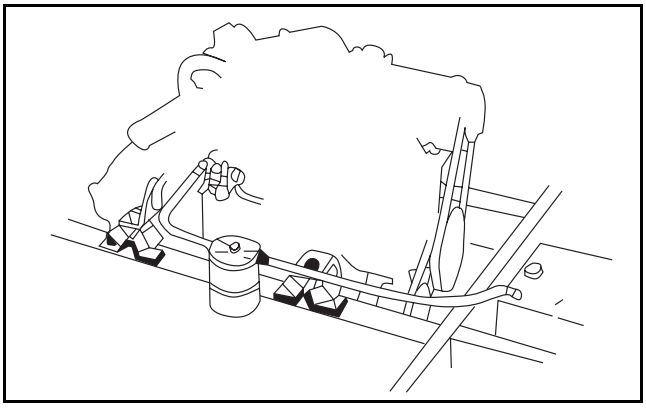


Figure 6.3 Extra Fuel Filter with Water Trap

6.5 Cooling Systems

The following features are necessary in any marine cooling system.

Intake thru-hull strainer. Do not align the seawater intake for the gen-set (in relation to direction of travel) with propulsion engine intake and screen. Flush-mount is recommended for the thru-hull strainer. Install strainers with slotted holes with slots parallel to direction of vessel movement. The area of the strainer opening(s) must be equal to or greater than the inside diameter of the water line hose to seawater pump.

Mount **seacock** to hull, attach it to intake, and ensure it is accessible for operation.

NOTE: Mount seacock according to manufacturer's specifications.

If using caulking to seal seacock, do not apply an excessive amount. Excess caulk causes incorrect water flow and in some cases develops a barrier which forces water upward, past seawater pump, and into engine cylinders. This condition is possible when vessel is moving and generator set is shut down.

Mount **seawater strainer** of sufficient capacity to seacock or permanent structure at a point not higher than seawater pump. Strainer should be accessible for servicing.

NOTE: Some seawater strainers include seacock and intake thru-hull strainer.

Water lines from seacock to engine-driven seawater pump are usually flexible hose. Reference ABYC Standard P-1 for acceptable exhaust hose materials. If using non-flexible water line, a flexible section of hose is necessary to allow vibrational motion of the generator set during operation. Support nonflexible water lines within 4 in. (102 mm) of their connection to the flexible section.

Keep piping straight and as short as possible. If the pipe is too long, water draw problems may occur. To remedy some problems with long pipe runs (usually over 15 ft (4.6 m), increase the hose size to the next standard pipe diameter. Example: substitute 3/4 in. (19 mm) for 5/8 in. (15.9 mm). See Chapter 2, Specifications, for inlet water line hose size.

6.6 Exhaust Systems

There are two types of exhaust system installations: silencer above the waterline and silencer below the waterline (see Figure 6.2).

Use water-cooled exhaust lines in all marine installations. Keep lines as short and straight as possible. ABYC Safety Standard P-1.6.i. recommends using two corrosion-resistant hose clamps, with a minimum width of 1/2 in. (13 mm), on each end of flexible exhaust hose connections. A pitch of at least 1/2 in. (13 mm) per running foot (30.5 cm) is acceptable. Use flexible exhaust hose conforming to UL Standard 1129 for engine wet exhaust components between mixing elbow and exhaust outlet. Independently mount the silencer to eliminate any stress on exhaust system and exhaust manifold/mixing elbow. See Chapter 2, Specifications, for mixing elbow water line hose size. See Figure 6.4 for exhaust connection to mixer elbow.

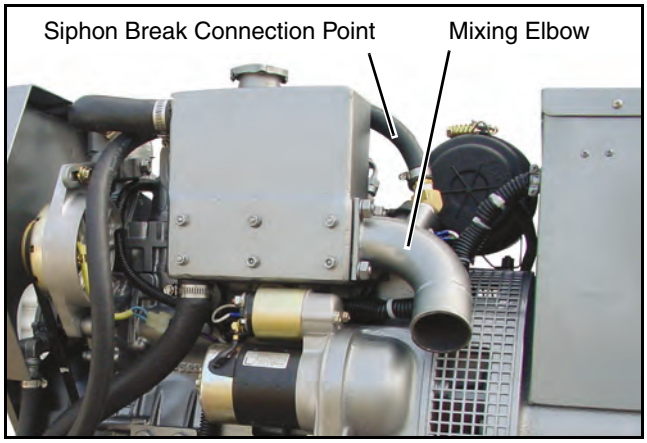


Figure 6.4 Mixing Elbow Connection. Install siphon break hose between heat exchangers and raw water outlet and exhaust elbows raw water inlet.

Model	Maximum Allowable Exhaust Back Pressure kPa (mm H_2O)	Minimum Exhaust Hose Size I.D. mm (in.)
MP5.5M	9.81 (1000)	51 (2.0)
MP8M	11.77 (1200)	

6.6.1 Siphon Break

A siphon break is installed to prevent seawater from entering the generator's engine. It is required if the exhaust manifold outlet is less than 9 inches above the waterline at any time.

Install siphon break according to manufacturer's instructions.

NOTE: A siphon break that is installed improperly will cause engine damage and may void the warranty.

6.7 Electrical Systems

6.7.1 AC Voltage Connections

Make AC connections to generator set inside the controller box. The generator set is usually connected to a ship-to-shore transfer switch which allows the use of shore power when docked or generator set power when docked or at sea. The wiring is then connected to a main circuit breaker box (panel board) which distributes branch circuits throughout the craft. See Chapter 7, Wiring Diagrams, for reconnection of generator set.

6.7.2 Battery

Batteries and installations must conform to USCG Regulation 183.420. Generator sets should use separate battery(ies) from propulsion engines whenever possible. Both generator set and propulsion engines' starting/charging systems must have a common negative (–) ground. See Table 6.1.

6.7.3 Wiring

Use stranded copper for all wiring. Wire gauges and insulation, conductor temperature ratings, sheath stripping, conductor support and protection, conductor terminals and splices, and overcurrent protection (circuit breakers, fuses) must conform to USCG Regulations 183.425 through 18.460. Use rubber grommets and cable ties, as necessary, to protect and secure wiring from sharp objects, exhaust system, and any moving parts.

Table 6.1 Gauge Operating Ranges

Distance Between Generator Set and Battery		Cable Size (AWG)		
ft	(m)	At 0°F (–18°C)	At 32°F (0°C)	At 75°F (24°C)
40	(12.2)	0	0	1
30	(9.1)	0	1	2
25	(7.6)	1	2	4
20	(6.1)	2	2	6
15	(4.6)	2	4	6
10	(3.0)	4	6	8
5	(1.5)	6	6	8
2.5	(0.8)	8	8	8

6.7.4 Remote Start Switch Connection

MasPower offers several remote panels for connection to the generator set. Refer to Chapter 8, Replacement Parts and Accessories, for further detailed descriptions.

Chapter 8 Replacement Parts and Accessories

8.1 Customer Service

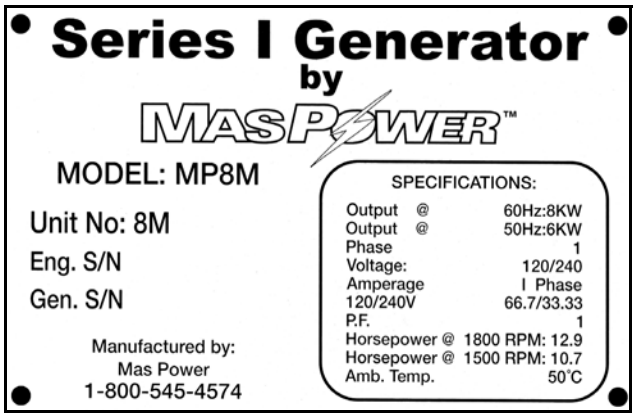
For further information or questions, contact the company directly at:

MasPower, Inc.
2801 Anvil Street North
St. Petersburg, FL 33710
Sales (727) 522-9471
1-800 545-4574
Service (727) 521-4661

To ensure supply of correct parts or information, make note of the following identification numbers in the spaces provided:

Series I Generator Set

Engine unit serial numbers are found on the nameplate attached to the generator set.



Sample Nameplate

Generator Set Accessories

An alternate nameplate inside the junction box identifies factory-installed generator set accessories.

Accessory Nos. _____

_____

_____

_____

8.2 Ordering Replacement Parts

⚠WARNING

Use genuine parts and specified lube oil and fuel oil. Failure to do so may cause an accident or affect equipment durability.

NOTE: When replacing hardware, do not substitute with inferior grade hardware. Screws and nuts are available in different hardness ratings. American Standard hardware uses a series of markings and metric hardware uses a numeric system to indicate hardness. Check markings on bolt head and nuts for identification.

NOTE: Fuse replacement. Replace fuses with fuses of the same ampere rating and type (for example, ABC or 3AC, ceramic). Do not substitute clear glass type fuses for ceramic fuses. If ampere rating is unknown or questionable, see wiring diagram. These are the most common replacement parts.

1. Lube oil filter (cartridge type)

Applicable Engine	Part Number
All	129150-35151

2. Fuel oil filter (cartridge type)

Applicable Engine	Part Number
All	124550-55700

3. Sea water pump impeller

Applicable Engine	Part Number
All	18653-0001

4. Fresh water pump and charging alternator driving belt

Applicable Engine	Part Number
MP 5.5 M	104514-42780
MP 8 M	119650-42291

5. Air filter element

Applicable Engine	Part Number
All	2S-E1

8.3 Accessories

Several optional accessories are available to finalize the installation or to add convenience to operation and service. Contact MasPower at (727) 522-9471 to obtain the most current information and to find a dealer nearest you. Accessories available at the time of print of this publication are as follows.

- **Super Quiet Sound Shield**—provides for highly effective silencing, ease of access for engine/generator servicing, low maintenance, excellent durability, and safety (see Figure 8.1 for dimensions).

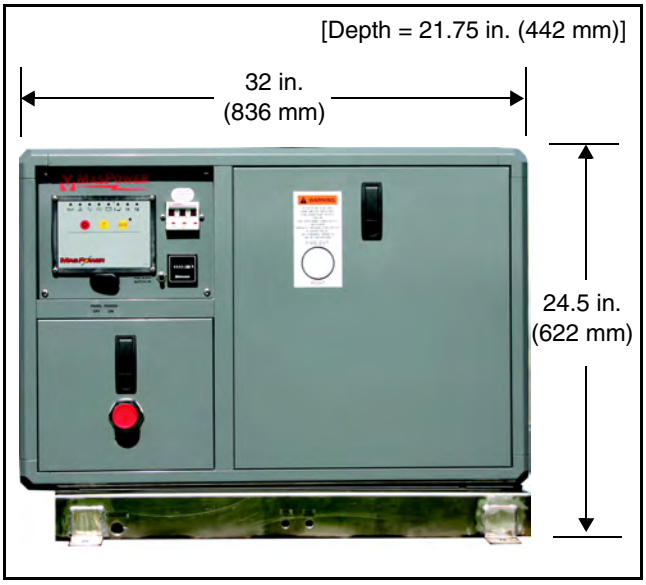


Figure 8.1 Optional Sound Enclosure (Model MP8M)

- **Siphon Break**—is required to prevent seawater entry into the engine when generator set is installed at or below water line.
- **Remote Start/Stop and Hourmeter Instrument Panel**—allows starting/stopping from a location remote of the generator set. Supplied with 15 ft (4.6 m) connection harness. Overall mounting dimensions are 4-1/16 in. (103 mm) by 2-1/4 in. (57 mm) (see Figure 8.2 for dimensions).

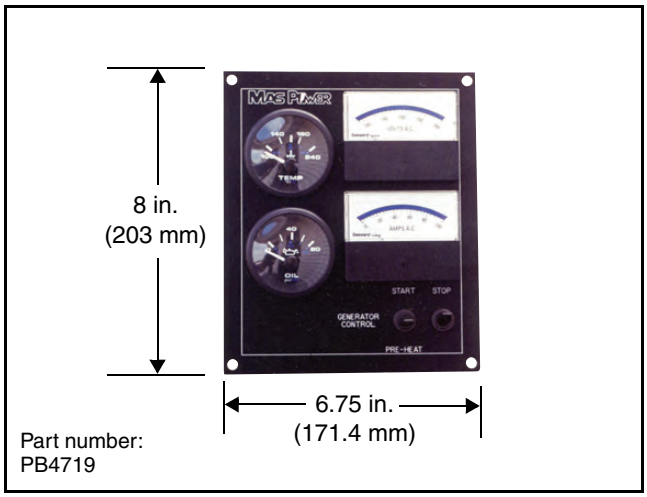


Figure 8.2 Remote Instrument 4-Meter Panel (analog)

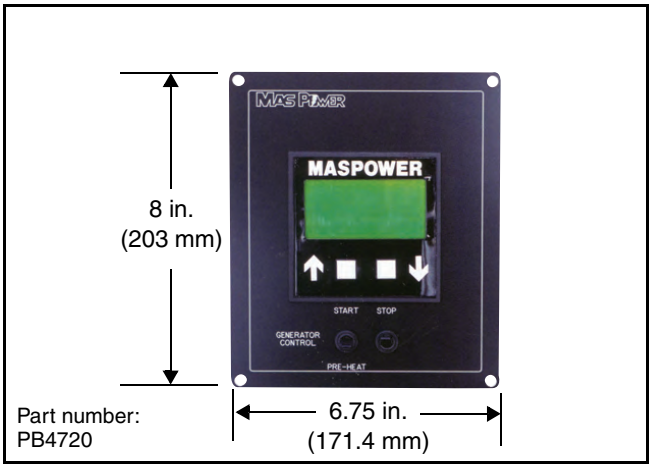
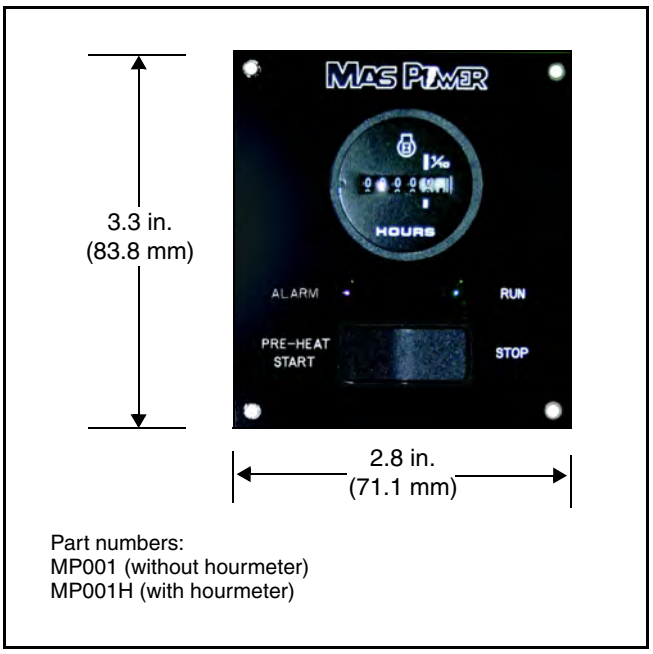


Figure 8.3 Remote Panel Controller (digital)

- **Remote Start Panel**—allows starting and stopping from a remote location (see Figure 8.4 for dimensions).



Part numbers:
MP001 (without hourmeter)
MP001H (with hourmeter)

Figure 8.4 Remote Start Panel

- **Plug-in Extension Wiring Harnesses**—provide additional wiring between all remote panels and controller connector in 5, 10, 20, 50, and 100 ft increments. One required for each remote meter panel kit.

Appendix A Glossary

ITEM	DESCRIPTION
AC	alternating current
AISI	American Iron and Steel Institute
AM	amplitude modification
amp	ampere
ANSI	American National Standards Institute
API	American Petroleum Institute
A/R	as required, as requested
A/S	as supplied, as stated, as suggested
ASA	American Standards Association (formerly ANSI)
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing Materials
aux.	auxiliary
AWG	American Wire Gauge
AWM	appliance wiring material
BHP	brake horsepower
bmep	brake mean effective power
Btu	British thermal unit
°C	Celsius degree
cc	cubic centimeter
CCA	cold cranking amps
CEC	Canadian Electrical Code
cfh	cubic feet per hour
cfm	cubic feet per minute
CID	cubic inch displacement
cm	centimeter, centimeters
cmm	cubic meters per minute
CPVC	chloropoly vinyl chloride
CSA	Canadian Standards Association
CT	current transformer
cu. in.	cubic inch(es)
CWC	city-water cooled
cyl.	cylinder
dB	decibel
dBA	decibels (A weighted)
DC	direct current
DCR	direct current resistance
EIA	Electronic Industries Association
EMI	electromagnetic interference
EPA	Environmental Protection Agency
°F	Fahrenheit degree
fl. oz.	fluid ounce(s)
FM	frequency modulation
ft.	foot, feet
ft. lbs.	foot pound(s)

ITEM	DESCRIPTION
fs	full scale
ga.	gauge (meters wire size)
gal./gals.	gallon, gallons
gph	gallons per hour
gpm	gallons per minute
gr.	grade
grd.	ground
Hg	mercury (element)
H_2O	water
HP	horsepower
hr, hrs.	hour, hours
HWT	high water temperature
Hz	hertz (cycles per second)
ID	inside diameter
IEEE	Institute of Electrical and Electronic Engineers
in.	inch, inches
in. lbs.	inch pounds
int.-ext.	internal–external
ISO	International Standards Organization
J	joule, joules
kg	kilogram, kilograms
kg/cm^2	kilograms per square centimeter
kgm	kilogram meter(s)
kJ	kilojoules (btu cal)
km	kilometer, kilometers
kPa	kiloPascal, kiloPascals
kph	kilometers per hour
kV	kilovolt
kVA	kilovolt amperes
kW	kilowatt, kilowatts
kWH	kilowatt hour
L	liter, liters
LED(s)	light emitting diode(s)
lb., lbs.	pound, pounds
L/hr.	liter per hour, liters per hour
L/min.	liter(s) per minute
LOP	low oil pressure
LP	liquefied petroleum
LWT	low water temperature
m	meter, meters
m^3	cubic meter, cubic meters
max.	maximum
MHz	megahertz
mi.	mile, miles

ITEM	DESCRIPTION
mil	one one-thousandth of an inch
min	minute
min.	minimum
mJ	milli joule(s)
MJ	mega joule(s)
mm	millimeter
m^3/min	cubic meters per minute
MPa	megaPascal
mpg	miles per gallon
mph	miles per hour
MS	military standard
mW	milliwatt(s)
MW	megawatt(s)
N/A	not available
NBS	National Bureau of Standards
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
Nm	Newton meter(s)
NPT	National Standard taper pipe thread per general use
N/R	not required
OC	overcrank
OD	outside diameter
OEM	original equipment manufacturer
OS	overspeed
O/S	oversize
OSHA	Occupational Safety and Health Act
OV	overvoltage
oz.	ounce, ounces
PF	power factor
PMG	permanent magnet generator

ITEM	DESCRIPTION
pot	potentiometer
ppm	parts per million
psi	pounds per square inch
pt., pts.	pint, pints
PVC	polyvinyl chloride
qt., qts.	quart, quarts
qty.	quantity
ref.	reference
RFI	radio frequency interference
r.h.m.	round-head machine (screw)
rms	root means square
RPM	revolutions per minute
RTV	room temperature vulcanization
SAE	Society of Automotive Engineers
SCR	silicon controlled rectifier
sec.	second, seconds
spec, specs	specification
sq.	square
sq. cm	square centimeter(s)
sq. in.	square inch(es)
tach	tachometer
temp.	temperature
turbo	turbocharger
UHF	ultrahigh frequency
UL	Underwriter's Laboratories, Inc.
US	United States
USA	United States of America
USCG	United States Coast Guard
V	volt, volts
vac	volts alternating current
vdc	volts direct current
VHF	very high frequency
W	watt, watts

Appendix B Related Publications

Observe the regulations and standards below when installing marine generator sets.

U.S. Coast Guard Code of Federal Regulations
Title 33
Subpart I—Electrical Systems
Subpart J—Fuel Systems

Title 46
Subchapter F—Marine Engineering
Part 58—Main and Auxiliary Machinery and Related Systems

Order the above publications from:
Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402
Phone: 1-202-783-8238

Boating Safety Circular Commandant (G-BC)
Boating Statistics (G-BP-1)

Order the above documents from:
U.S. Coast Guard Headquarters
2100 Second Street, S.W.
Washington, DC 20593-0001
Boating Safety Hotline: 1-800-368-5647

Underwriters Laboratories, Inc. (UL)
Publications Stock
333 Pfingsten Road
Northbrook, IL 60062
Marine Department Phone: 1-919-549-1400

NFPA 302
National Fire Protection Association
Batterymarch Park
Quincy, MA 02269

Society of Automotive Engineers (SAE)
Customer Service
400 Commonwealth Drive
Warrendale, PA 15086
Phone: 1-412-776-4970

American Boat and Yacht Council, Inc. (ABYC)
3069 Solomon's Island Road
Edgewater, MD 21037
Phone: 1-410-956-1050
Phone: 1-410-974-8112
Fax: 1-410-956-2737

IEEE 45
The Institute of Electrical and Electronics Engineers Inc.
345 East 47th Street
New York, NY 10017

Appendix C Service Log

Use the log below to keep a cumulative record of operating hours on your Series I generator set and the dates required services were performed. Enter hours to the nearest quarter hour.

	OPERATING HOURS		RECORD OF SERVICE	
DATE	HOURS RUN	TOTAL HOURS	DATE OF SERVICE	SERVICE PERFORMED

Appendix D Emissions Regulations

⚠WARNING

CALIFORNIA PROPOSITION 65

Engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

Diesel Engine Exhaust

Exhaust emissions regulations for diesel engines have been evolving worldwide by authorities such as the US EPA/Calif. ARB, European EU & EC, IMO under the auspices of the UN, the Ministry of Construction in Japan, and so on. In all cases, Yanmar has met the challenge by obtaining "Certificates of Compliance" issued by the authorities. **Yanmar is compliant with worldwide exhaust emissions regulations.**

DSE 703 Troubleshooting Lights

Oil Can Light

Means: Loss of oil pressure

Check:
- Oil level
- Oil pressure switch
- Engine Oil pressure with pressure gauge

Fix:
- Add oil / check for leaks
- Replace oil pressure switch
- R & R engine bearings, oil pump, etc.

Thermometer Light

Means: High Coolant Temp

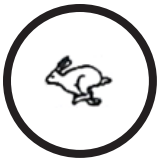
Check:
- Coolant level
- Coolant leaks in exhaust manifold hoses & engine
- Coolant pump & belt
- Loss of cooling water

Fix:
- Add coolant (Dexcool 50/50)
- Repair any leaks. Replace any hoses or hose clamps as needed
- Tighten or replace belt, check coolant pump and repair/replace as needed
- Check raw water system for leaks or blockages, check heat exchanger for leaks or blockages, check that water supply is not blocked, check raw water pump for prime, worn impeller, etc.

YANMAR

DIESEL MASPOWER

www.maspowerproducts.com
7177 30th Ave North • St. Petersburg, Florida 33710
Tel. 727.522.9471 • Fax 727.381.3235
For Georgia & Alabama 229.347.8394
Toll Free 800.545.4574

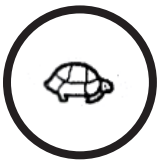


Rabbit Light

Means: Over speed

Check:
- Engine Speed
- Controller programming

Fix:
- Adjust engine speed to proper level
  - 50 Hz sets 53 Hz No load
  - 60 Hz sets 63 Hz No load
- Program controller for either 50 Hz or 60 Hz operation

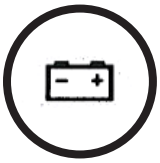


Turtle Light

Means: Under speed

Check:
- Engine Speed
- Generator over load
- Controller program or speed signal
- No generator output

Fix:
- Adjust engine up to correct speed
- Disconnect high load devices
- Program controller for proper speed setting check for voltage to controller speed input
- Check generator voltage regulator exciter coil or windings repair or replace as needed



Battery Light

Means: Charging system not operating

Check:
- Belt Tension
- Dynamo or alternator have no output

Fix:
- Tighten or replace belt
- Bench test for shorts, bad windings, worn bearings, etc. Check connections on charging circuit. Check for output on exciter wire.

(On dynamo systems, make sure the regulator body is grounded to engine.)

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Toll Free 800.545.4574

Light

Means: Fail to start

(Generator attempted three times to start but did not).

Check:
- Fuel system and filters
- Check for AC output

Light

Means: Head temp or exhaust overheat

Check:
- Loss of coolant or cooling water flow

Fix:
- Check coolant system for leaks, bas hoses, bad coolant pump, etc.
- Check cooling water systems for leaks, blockages, etc.

Light

Not used

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Configuration Mode is selected by operation of a small switch on the rear, left-hand edge of the PCB. This is partially hidden to prevent accidental operation. See figs 1 and 2.

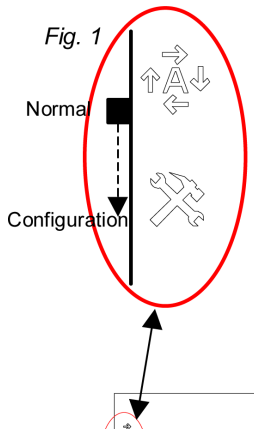


Fig. 1

Once Configuration Mode is selected, the 'Auto' LED will commence rapid flashing. When in Configuration Mode all normal operation is suspended. The 'Stop' push button can be used to select the LED 'code' that corresponds to the required function. The 5 left hand LED's will form the code. The 'Manual' push button will allow the user to change the function parameters. The 3 right-hand LED's inform the user of the current setting for the chosen function. When the required parameters are displayed, pressing the 'Auto' button will save the new setting. The process is repeated for each function change. When configuration is complete, the Configuration Mode Selector Switch should be returned to the 'Normal' position. A key to all configuration options is provided overleaf on the Functions and Parameters table.

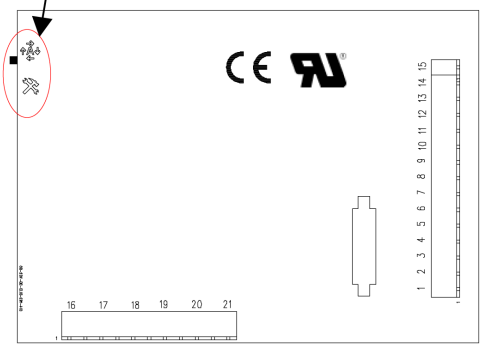


Fig. 2
Diagram of reverse side of 703

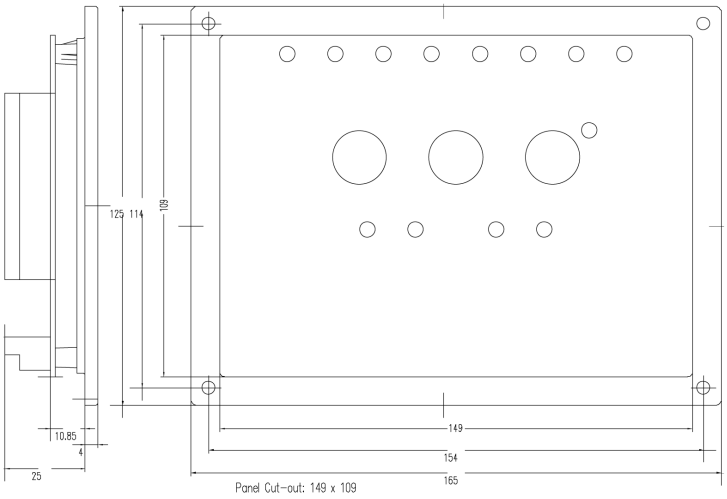
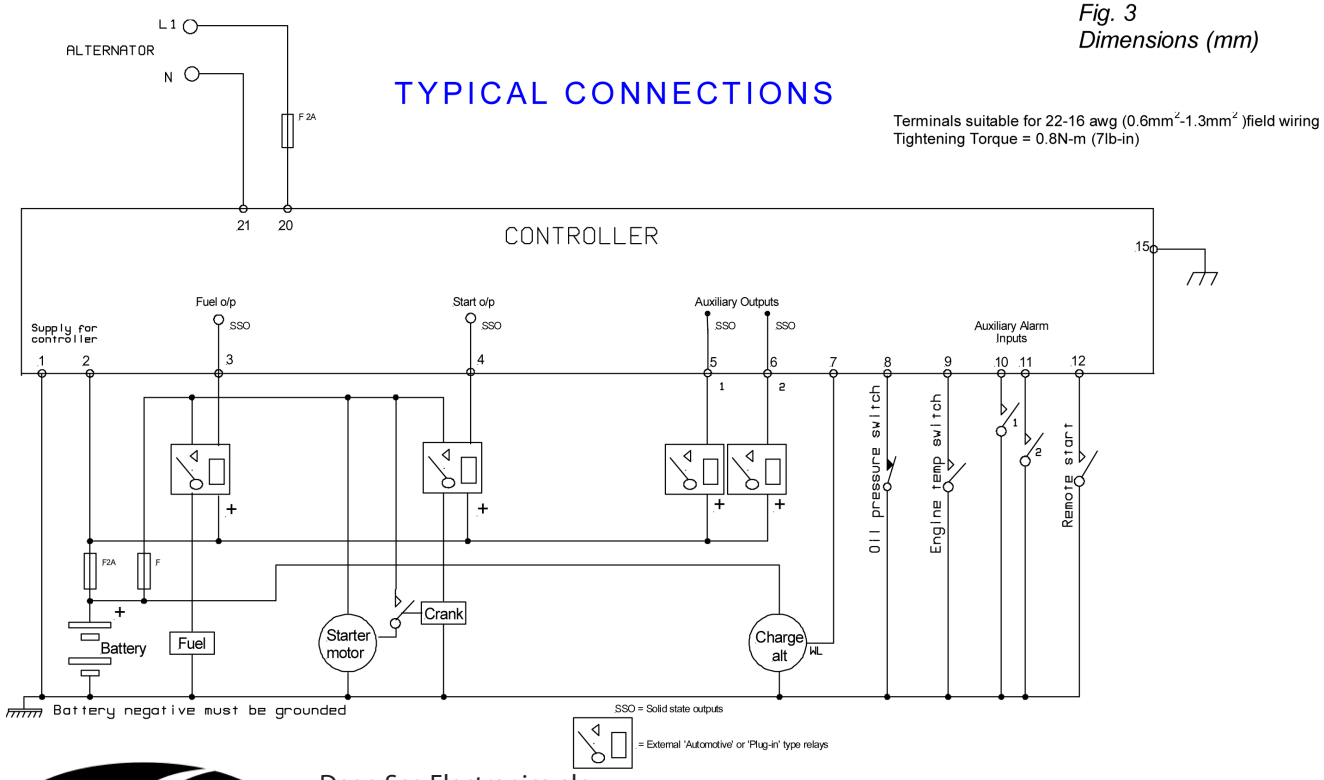


Fig. 3
Dimensions (mm)

TYPICAL CONNECTIONS

Terminals suitable for 22-16 awg (0.6mm^2-1.3mm^2)field wiring
Tightening Torque = 0.8N-m (7lb-in)



Deep Sea Electronics plc
Highfield House, Humanby Industrial Estate, North Yorkshire, YO14 0PH, England
Tel: +44 (0) 172 389-0099 Fax: +44 (0) 172 389-3303 E-mail: sales@deepseaplc.com

703 Installation

FUNCTIONS AND PARAMETERS TABLE

Function							1	2	Value **(MasPower Defaults in Grey)**
Pre-heat Timer	○	○	○	○	●	○	○	○	0 Seconds
						○	○	●	5 Seconds
						○	●	○	10 Seconds
						○	●	●	15 Seconds
						●	○	○	20 Seconds
						●	○	●	30 Seconds
						●	●	○	60 Seconds
						●	●	●	180 Seconds
Start Delay	○	○	○	●	○	○	○	○	0 Seconds
						○	○	●	5 Seconds
						○	●	○	10 Seconds
						○	●	●	15 Seconds
						●	○	○	20 Seconds
						●	○	●	30 Seconds
						●	●	○	60 Seconds
						●	●	●	180 Seconds
Stop Delay	○	○	○	●	●	○	○	○	0 Seconds
						○	○	●	5 Seconds
						○	●	○	10 Seconds
						○	●	●	15 Seconds
						●	○	○	20 Seconds
						●	○	●	30 Seconds
						●	●	○	60 Seconds
						●	●	●	180 Seconds
Energise to Stop Timer	○	○	●	○	○	○	○	○	0 Seconds
						○	○	●	5 Seconds
						○	●	○	10 Seconds
						○	●	●	15 Seconds
						●	○	○	20 Seconds
						●	○	●	30 Seconds
						●	●	○	60 Seconds
						●	●	●	180 Seconds
Nominal Frequency	○	●	○	○	○	○	○	○	50 Hz (O/S + 14% / Overshoot +24%)
						○	○	●	60 Hz (O/S + 14% / Overshoot +24%)
Nominal DC Voltage	○	●	○	○	●	○	○	○	12V DC (CF 8V)
						○	○	●	24V DC (CF 16V)
LOP Switch Contact	○	●	○	●	○	○	○	○	Close on Fault
						○	○	●	Open on Fault
HET Switch Contact	○	●	○	●	●	○	○	○	Close on Fault
						○	○	●	Open on Fault
Crank disconnect on Oil Pressure	○	●	●	○	○	○	○	○	Disabled
						○	○	●	Enabled (2 second delay)
Underspeed detection	○	●	●	○	●	○	○	○	Disabled
						○	○	●	Enabled (U/S – 20%)
Auxiliary Input 1 Function	●	○	○	○	○	○	○	○	Immediate Warning Close on Fault
						○	○	●	Immediate Warning Open on Fault
						○	●	○	Immediate Shutdown Close on Fault
						○	●	●	Immediate Shutdown Open on Fault
						●	○	○	Delayed Warning Close on Fault
						●	○	●	Delayed Warning Open on Fault
						●	●	○	Delayed Shutdown Close on Fault
						●	●	●	Delayed Shutdown Open on Fault
Auxiliary Input 2 Function	●	○	○	○	●	○	○	○	Immediate Warning Close on Fault
						○	○	●	Immediate Warning Open on Fault
						○	●	○	Immediate Shutdown Close on Fault
						○	●	●	Immediate Shutdown Open on Fault
						●	○	○	Delayed Warning Close on Fault
						●	○	●	Delayed Warning Open on Fault
						●	●	○	Delayed Shutdown Close on Fault
						●	●	●	Delayed Shutdown Open on Fault
Auxiliary Output 1 Function	●	○	○	●	○	○	○	○	Not Used
						○	○	●	Pre-heat
						○	●	○	Engine Running
						○	●	●	Common Warning
						●	○	○	Common Shutdown
						●	○	●	System in Auto
						●	●	○	Common Alarm
						●	●	●	Energise to Stop
Auxiliary Output 2 Function	●	○	○	●	●	○	○	○	Not Used
						○	○	●	Pre-heat
						○	●	○	Engine Running
						○	●	●	Common Warning
						●	○	○	Common Shutdown
						●	○	●	System in Auto
						●	●	○	Common Alarm
						●	●	●	Energise to Stop

Chapter 7 Wiring Diagrams

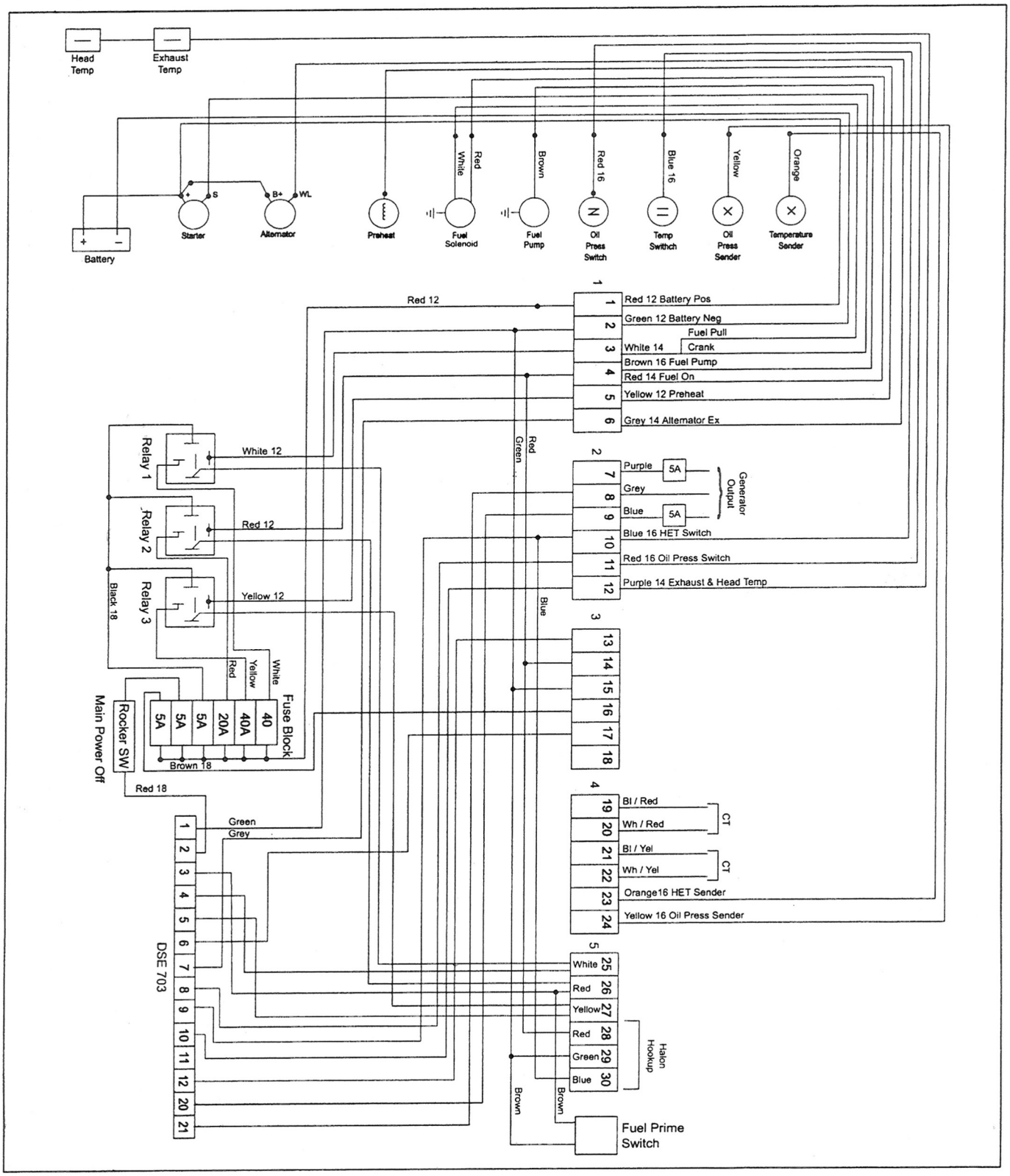


Figure 7.1 Wiring Diagram Schematic (MP703)

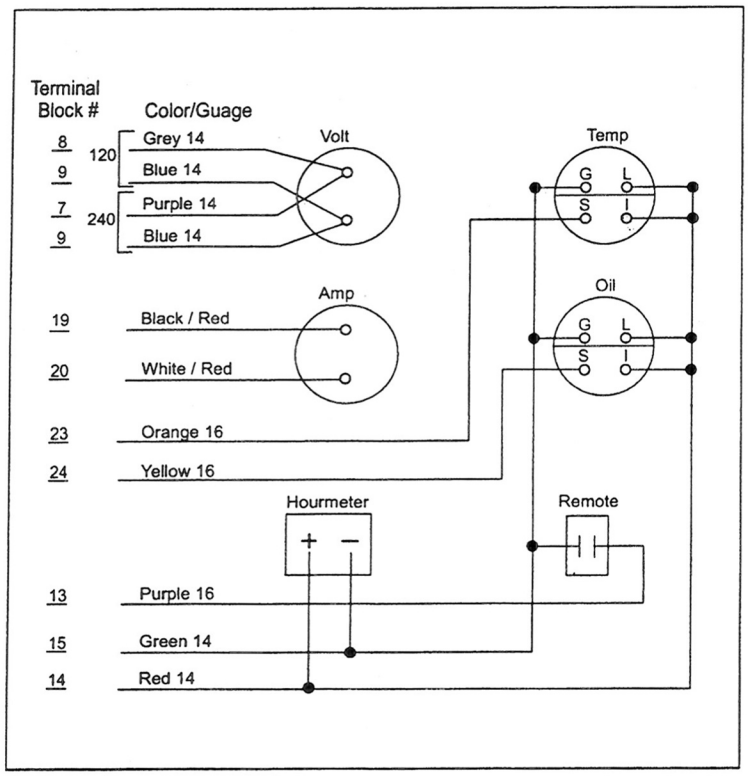


Figure 7.3 Four Gauge Remote Panel Hookup

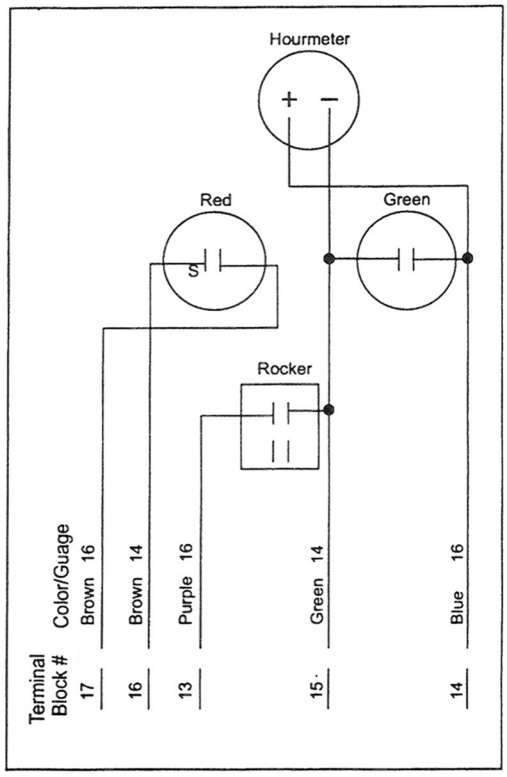


Figure 7.4 Standard Panel Hookup

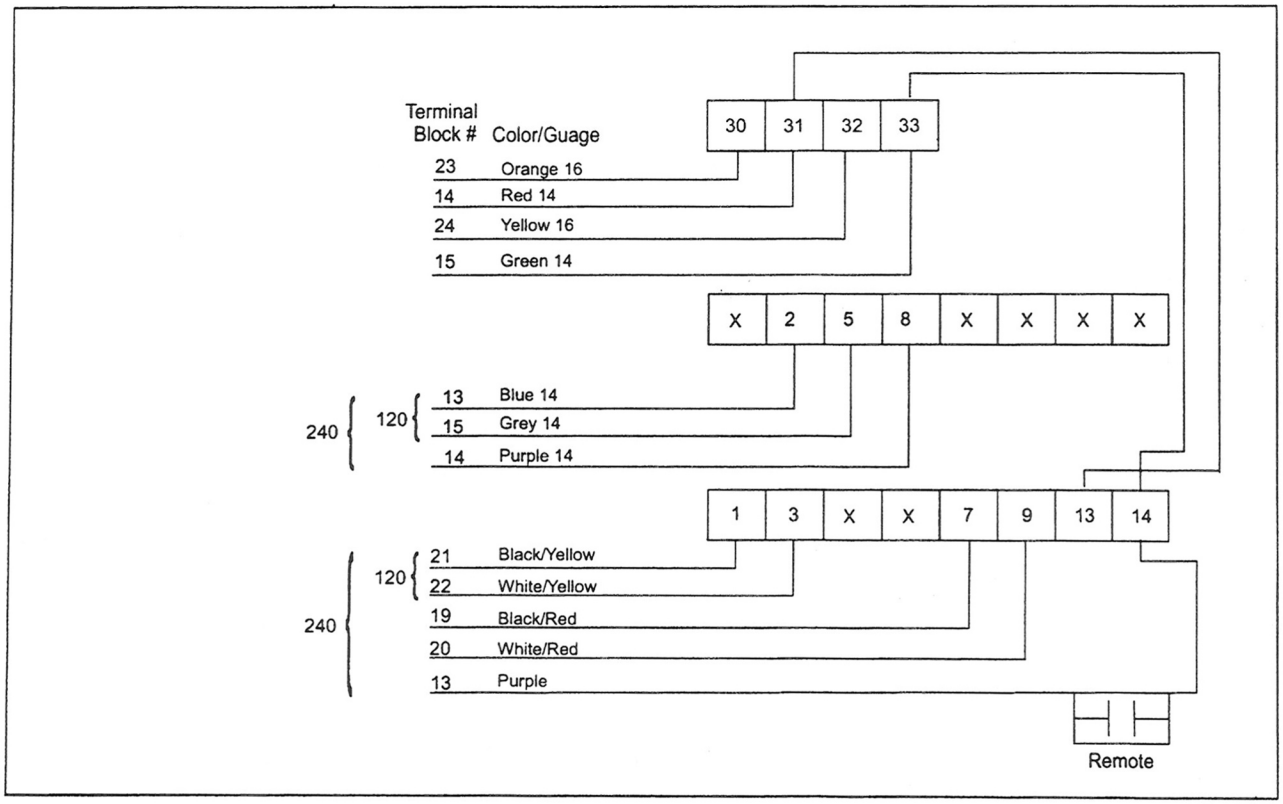


Figure 7.5 Multigen Remote

MAC POWER
multitek
MULTI-GEN GENERATOR MONITORING SYSTEM
START
STOP
GENERATOR CONTROL
PRE-HEAT